United States Department of Agriculture Forest Service **Rocky Mountain Region**

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Draft Environmental Impact Statement for Glade Rangeland Management

Dolores Ranger District, San Juan National Forest, Dolores and Montezuma Counties, Colorado

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Cover photo: Glade Landscape from the 504 Road (2015)

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Executive Summary

The Forest Service has prepared this Draft Environmental Impact Statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This DEIS discloses the direct, indirect, and cumulative environmental impacts that would result from implementing the Proposed Action and alternatives. The document is organized into six chapters and includes a glossary, references, and appendices.

The eight allotments on the Glade landscape have been managed for domestic livestock grazing for decades. Range monitoring transects show much improvement has taken place on this landscape historically. Recent monitoring results, however, have shown that areas showing improvement have stalled out before reaching desired conditions and those in stable conditions have started to decline. In addition, several springs, seeps, swales and wetlands are in poor condition and need restoration.

Issues found on the landscape include the following:

- Many swales in parklands have poor plant species composition with little riparian vegetation species and the presence of bare streambanks.
- Certain brome dominated parks, pinyon-juniper, mountain shrubland and sagebrush shrubland vegetation types lack litter, crusts and mat-forming vegetation to prevent continuous overland water flows.
- Certain mountain grassland parks lack deep rooted native bunchgrasses, proper species composition and ground cover necessary for hydrologic function.
- Specific mountain and sagebrush shrublands have too much bare ground, poor species diversity and lack age class diversity.
- Invasive species are expanding in some areas.

This project proposes to adjust livestock grazing management to 1) move rangeland health towards desired conditions, and 2) to improve functioning ecosystem resiliency to environmental stressors.

For example, the ecological function of mountain grasslands could be restored if the presence of deep rooted native bunchgrasses would increase. Each pasture with mountain grasslands has enough available forage to provide for livestock grazing, however, the problem is the distribution of use. An important assumption is that improved use patterns would result in improved conditions.

To address problems in mountain grasslands, the Proposed Action would implement changes within 1-5 years on the Salter, Mair and Calf allotments and these changes would occur based on use mapping. During the first grazing season after the final decision, USFS staff would begin mapping livestock use across each pasture on the above three allotments. If in 2 out of 3 years the mapping effort shows poor distribution (for example, bulk of use in parklands and little or

no use in woodland/shrub areas) then capacity would be set based on acreage of suitable range actually used. For example, a pasture that shows 1/3rd suitable acres not used while other areas in that pasture receive a disproportionate amount of use and exceed established use criteria, would be reduced in time by 1/3rd.

The change in number of days cattle may graze a pasture cannot be undertaken in the first grazing season immediately following a final decision because the use mapping must happen first. Although a problem with distribution of cattle use is known today, the extent of the problem is not known. This is why use mapping must occur to identify the needed change. For the other 3 allotments with Term Grazing Permits (Glade, Lone Mesa and Long Park), use mapping is listed as an adaptive action to be undertaken if needed.

This project has also identified the ecological function of the other vegetation types across the glade landscape and what actions would be necessary to take to continue upward trends into the future. Some of these actions can be taken now (Proposed Action). Should monitoring show that these actions are ineffective in meeting objectives, adaptive management actions have been identified and would be implemented.

Another method for ensuring that the current upward trends in range conditions continue is the identification of key sites within each allotment that are monitored. In addition, the IDT developed a list of ecological conditions to 'keep an eye on'. For example, it would be important in short grass communities to watch for overland water flow patterns. During allotment inspections if USFS observes connected water flow patterns beginning, then the staff would identify the need for more detailed monitoring to determine solutions.

Approximately 20 springs are in need of reconstruction and/or restoration since livestock use has altered water flow patterns and water quality. To address problems at identified spring sites, actions are proposed to work on at least 2 springs per year starting year 1 of implementation of the final decision. Actions include visiting the spring site and changing pipe, spring box, fencing, etc. and water flows so that livestock can use the water in a manner that maintains spring function.

Appendix B provides the connections between desired conditions, proposed actions, monitoring and adaptive actions for each allotment. **It is important for the reader to print out Appendix B of this DEIS and have it available to read along with the rest of the text**.

Chapter 1 of this DEIS provides background information and describes the Purpose and Need for this project. A reference for the Purpose and Need is Appendix D, labeled 'NFMA Report' which describes the pre-NEPA analysis for this landscape. It is important to note that the Desired Conditions listed in Appendix B were developed through interpretation of the San Juan Land and Resource Management Plan. In the NFMA Report, Desired Condition statements in the Forest Plan were applied to each major vegetation type across the glade landscape. Desired Conditions by major vegetation type were then applied to each allotment.

Chapter 2 describes the Alternatives (but must be read with Appendix B). The Alternatives include Alternative A-No Permitted Livestock Grazing, Alternative B- Current Permitted Grazing

and Management (No Action), and Alternative C- Proposed Action with Adaptive Management. Design features applied to all allotments under the Proposed Action alternative are described in Chapter 2, along with monitoring task descriptions. A set of tables at the end of Chapter 2 summarize the differences between the alternatives.

Chapter 3 describes the Environmental Consequences of the Alternatives. Alternative A (No Permitted Livestock Grazing) would address range health issues and progress towards desired conditions faster than Alternatives B and C. However, the loss of reservoirs would reduce the distribution of water sources across the landscape and the loss of livestock grazing would not meet the Purpose and Need for providing sustainable livestock operations. Alternative B continues current management without specifically addressing known issues. This alternative meets the purpose and need of sustaining livestock operations, but it does not move all areas towards desired conditions. Alternative C would meet both the Purpose and Need as well as Forest Plan direction and desired conditions. Alternative C addresses range health issues by adjusting stocking rates to better align with current use and available forage, continues long-term monitoring, and identifies some simple ecological factors to 'keep an eye on'. Desired condition descriptions for Alternative C are more detailed and more relevant to Glade landscape vegetation types. Desired conditions in Alternative C are based on ecological function and long term resiliency and are important goals in the San Juan Forest Plan. **The preferred alternative at this time is identified as Alternative C.**

Chapter 4 Lists the preparers of this DEIS and Chapter 5 lists Consultation and Coordination efforts undertaken for this project.

Additional documentation, including specialist reports, correspondence, and analyses may be found in the Project Record Document located at the Dolores Ranger District in Dolores, Colorado. These records are available for public review pursuant to the Freedom of Information Act (5 U.S.C. 552).

Chapter 1: Purpose of and Need for Action

1.1 Background

The Dolores Ranger District of the San Juan National Forest is proposing to modify livestock grazing management on eight allotments: Brumley, Calf, Glade, Lone Mesa, Long Park, Mair, Sagehen, and Salter. The proposal was developed by an interdisciplinary team of Forest Service resource specialists and contains specific actions for each allotment to address resource concerns. Please refer to the enclosed maps in Appendix A for a general location of allotments. The primary purpose for this project is to manage for healthy sustainable and resilient resource conditions while maintaining viable livestock operations.

1.1.1 Guiding Documents

It is important to know the relationship amongst a variety of documents used to manage livestock grazing on National Forest administered lands. These documents include the Code of Federal Regulations (CFR), Forest Service Manual and Handbooks, The San Juan National Forest Land and Management Plan (Forest Plan), the Environmental Impact Statement (EIS) and associated decision, the Term Grazing Permit, the Allotment Management Plan (AMP), and the Annual Operating Instructions (AOI). Each of these documents can be thought of as a step down approach to managing a piece of land, starting with the broadest guidance and ending with the most site and time specific (Table 1.1).

The **Code of Federal Regulations** (CFRs) is the rules and regulations published in the *Federal Register* by the executive departments and agencies of the federal government of the United States. The U.S. Forest Service must follow the rules specifically listed for them in 36 CFR Chapter 11, parts 200-299 as well as others. The specific application of these rules for the U.S. Forest Service is described in **Forest Service Manuals** which provide further details in **Handbooks**. The 2200 Manual and Handbook pertain specifically to how to administer the range management program within the Forest Service. The next management document is the **San Juan National Forest and Land Management Plan** (Forest Plan). This document provides clarification on how our mandates are to be applied to the San Juan National Forest. The Forest Plan provides overall (and in some cases specific) direction, guidelines and standards for managing all resources on this forest. Applying Forest Plan direction to permitted livestock grazing on a specific piece of ground (such as the eight grazing allotments within the Glade landscape) requires an analysis which we are completing through an **Environmental Impact Statement** (EIS). Once the analysis is complete and a decision is made, the decision is applied to each individual grazing allotment through an **Allotment Management Plan** (AMP). This document implements the decision reached through the EIS process for the long-term management of a specific allotment. However, conditions may change every year that would require adjustments or specificity on how to apply the AMP for that year. Provided that the needed changes are consistent with the higher level Decisions, they may be documented in the

Annual Operating Instructions (AOI). The **Term Grazing Permit** is the formal agreement between the grazing permittee and the National Forest authorizing the permittee to place his livestock on the forest. The permit incorporates all stipulations for use listed in the above documents.

Table 1.1 Examples of the level of direction contained in guiding documents

Document	Example
Code of Federal Regulations	36 CFR Chapter II, Part 222 Subpart A Section 222.9: The Chief, Forest Service, is authorized to install and maintain structural and nonstructural range improvements needed to manage the range resource on National Forest System (NFS) lands and other lands controlled by the Forest Service
Forest Service Manual/Handbook	FSM 2242.02 Install structural range improvements to obtain proper livestock management and to meet objectives contained in forest land and resource management plans and allotment management plans
San Juan National Forest Land and Resources Management Plan	2.6.29 Land use activities (new projects, or replacement/retrofitted/reconstructed/reauthorized projects) must not impact potentially useable groundwater quality or quantity to the extent that groundwater-dependent features are adversely affected. Examples of some groundwater-dependent features are springs, seeps, fens, and intermittent or perennial streams.
Environmental Impact Statement & Decision	Cole Water Spring in the Beef pasture of the Glade Allotment needs the water source fenced and the headworks developed.
Allotment Management Plan	The Cole Water Spring is scheduled for reconstruction in 2020. Site protection would include a four-strand barb wire fence around the spring source, approximately 40’ x 40’ in size; with the headworks needing gravel fill, piping out of riparian area approximately 60 feet to a 2’ x 8’ trough with an escape ramp for wildlife.
Annual Operating Instructions	Reconstruction of Cole Water Spring to begin this year with completion planned for August. Details of construction are found in the AMP.
Term Grazing Permit	Permit modification identifies specific materials given to permittee and construction specifications (i.e 3” pvc 60 feet long, one 200 gallon galvanized trough… construct 40’ x 40’ 4-strand permanent wire fence according to attached specification…) for the purpose of

	reconstructing Cole Water Spring to be completed by August 15 date.

1.1.2 Types of Management Actions

This analysis identifies desired conditions, existing conditions, and what the differences are between the two. The difference between existing and desired conditions is our purpose and need. There are three primary types of actions that will take place on allotments to meet our purpose and need; the use of livestock management tools, the proposed action, and adaptive management actions.

There are a variety of ***livestock management tools*** available to managers and permittees that can affect resources differently when implemented. These tools are often used to improve range conditions and/or accommodate permittee operations. Each allotment and each permittee is different; therefore, what tools work best for one allotment may not be the best tools for another allotment. The use of these livestock management tools may or may not result from monitoring. They are used on a regular basis and can be implemented and/or adjusted quickly, even on a daily basis. Under "Background for Analysis" under the Range Section in Chapter 3, a more thorough description of livestock impacts and how management tools can be used to alleviate those impacts is described. An example list of tools includes alterations in:

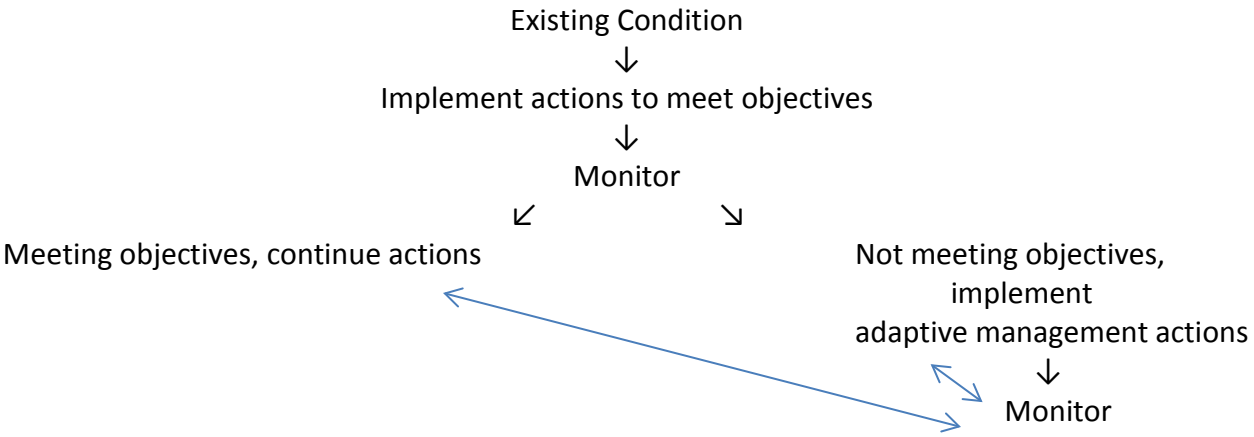
Season of Use
Numbers of Livestock
Kind of livestock
Age class of Livestock
Intensity and Duration of grazing
Grazing System
Herding
Resting
Splitting and Combining Pastures
Salting and Mineral Supplements
Fence uses to control livestock distribution or use
Water availability and distribution

The need for improvement shown in this analysis resulted in a list of management activities that are described as the ***Proposed Action*** (Appendix B). Proposed Actions are planned for implementation within 1-4 years following the signing of the decision and have the intent of moving the landscape towards desired conditions.

To assure desired conditions are achieved in a timely manner, objectives for meeting these conditions are described with specific timeframes and measures for results. Monitoring for both short-term and long-term management objectives is included to chart progress. Trigger

points are identified for adjusting actions should progress not be made or not be made within desired timeframes. *Adaptive management* options are implemented once a trigger point is reached where movement towards desired conditions is not progressing as planned. This process is considered "adaptive" because you set your desired conditions, you take actions to meet them, you monitor to see if they are being met or moving toward being met, and if not, you adjust your actions to do so, and repeat monitoring. It is a cyclic process. Options are evaluated during this analysis so they may be available if or when they are needed as determined through monitoring and analysis.

Both short-term monitoring (are we *implementing* our actions as planned?) and long-term monitoring (are our actions *effective* in meeting our objectives?) are incorporated into this process. Adaptive management options may be implemented if short-term monitoring indicates proposed actions are not moving us towards desired conditions. Adaptive management may also be applied should long-term monitoring indicate that our actions are not being *effective* in achieving our desired conditions in the established timeframes. The adaptive options must be within our analysis and decision. The adaptive management process also allows us to deal with uncertainty and changing conditions over time.



1.2 Area and Scope

The analysis area, referred to as "The Glade landscape", encompasses 164,176 acres of the western portion of the Dolores Ranger District, San Juan National Forest in southwest Colorado. The name "Glade" describes the landscape, which consists of a series of scattered meadows or parklands (i.e. 'glades') across the mesa. Allotments in the analysis area contain anywhere between 4 and 10 pastures and range in size from about 8,000 to 38,000 acres each. There are approximately 120,000 acres considered suitable for livestock grazing across the landscape. Nine livestock grazing permittees currently operate in this area permitting a total of nearly 20,000 (Animal Unit Months) AUMs. The analysis area contains eight primary vegetation types

including ponderosa pine/Gambel oak, mountain grassland, aspen, pinyon-juniper, mountain shrubland, sagebrush shrubland, and riparian types.

1.3 Purpose of Action

The purpose for the action being analyzed is to continue to authorize sustainable livestock grazing on all or portions of the project area while adjusting livestock management to move resource conditions from existing conditions toward desired healthy sustainable and resilient resource conditions.

1.4 Need for Action

Appendix B, Proposed Action Table, identifies the desired conditions for each allotment. Where the existing condition departs from the desired condition, a resource concern was identified. Where the existing condition matched desired condition, no needs were identified. The need for action is to address these resource concerns. The following Table summarizes the need for action:

Vegetation Type/Issue	Existing Condition at Specific Locations	Desired Conditions	Allotments with Departure
Spring, seeps and riparian areas	Poor species composition and bare ground widespread with a slight to moderate and moderate to extreme departures from reference conditions. Evidence of water flow patterns, pedestals, gullies, and compaction.	• Maintain water sources at Properly Functioning Condition (PFC) or moving towards PFC with properly functioning water, soil and vegetation cycles; perpetuating and reproducing riparian plant communities; provide and maintain stable, defined channels with appropriate width/depth ratios for stream type; balanced erosion/deposition levels consistent with the stream type and background sediment load. • There would be at least 80% of potential ground cover within 100' from the edges of all perennial streams, or to the outer margin of the riparian ecosystem, where wider than 100 feet • Riparian shrub cover in woody plant communities would be at least 35% to include a variety of species and age classes appropriate to site potential	Brumley Allotment Calf Allotment Glade Allotment Lone Mesa Allotment Long Park Allotment Mair Allotment Salter Allotment
Low Gradient Swales/Slope Wetlands	Poor plant species composition with little riparian vegetation. Some locations with bare banks and	• Maintain water sources at Properly Functioning Condition (PFC) or moving towards PFC with increased water holding species such as sedges. • Swales saturated at or near the surface	Calf Allotment Long Park Allotment Mair Allotment Salter Allotment

Vegetation Type/Issue	Existing Condition at Specific Locations	Desired Conditions	Allotments with Departure
	downcutting.	more often than not. • Diverse composition of riparian vegetation that includes water sedge, beaked sedge, common spikerush; minimal amount of forbs. • Continuous mat of riparian species providing adequate cover to protect soil surface. • It is no longer downcutting, vegetation is stabilizing the bed and banks, previously bare areas are covered with a continuous mat of riparian species, and headcuts are no longer actively eroding.	
Mountain Grassland/ Native Parks	Poor species composition, lacks ground cover from both litter and plants. Where native plants present, they are declining.	• Maintain sufficient residual cover in the form of plants and litter to reduce bare ground, hold soil moisture and increase native bunchgrasses. • Native bunchgrass clumps are present and have the highest relative dominance and density of any vegetation. • Mixed native grass and forb communities provide a mosaic of amounts of litter; principle grass species may include Arizona Fescue, Mountain Muhly, timber oakgrass, Parry's oatgrass, native brome species and sand dropseed. Grasses communities show vigor. • Bare ground less than 10%, litter makes up at least 30-50%, and vegetation basal cover is 40-60%.	Brumley Allotment Calf Allotment Mair Allotment Salter Allotment
Mountain Grasslands/ Brome Parks	High percentage of bare ground with connected water flow paths. In some areas evidence of erosion with loss of topsoil.	• Maintain sufficient residual cover in the form of plants and litter to reduce bare ground and break up continuous overland flow patterns, capturing water and preventing soil movement. • Bare ground is less than 10% in a discontinuous pattern so that water flow patterns are not connected.	Calf Allotment Sagehen Allotment
Ryman Pinyon-juniper	Litter, vegetation, and biological crusts not adequate to capture water and prevent erosion. Rills and	• Maintain sufficient residual cover in the form of plants and litter to reduce bare ground and break up continuous overland flow patterns At least 50% understory cover includes a combination of grasses, tree litter,	Brumely Allotment Lone Mesa Allotment

Vegetation Type/Issue	Existing Condition at Specific Locations	Desired Conditions	Allotments with Departure
	pedestals prevalent.	biological crust • Common species include Indian ricegrass, mutton grass, Western wheatgrass, prairie junegrass, blue grama, low muhly, needle-and-thread, Gambel's oak, squaw apple, serviceberry, Wyoming big sage • Where shortgrasses exist they form continuous sod over 80% of area • Where midgrasses or bunchgrasses exist they are well formed with tall seed stalks and bunches grow close together • No active pedestaling or rills are present. Overland water flow is not connected. Bare ground is in a discontinuous pattern.	
Mountain Shrublands and Sagebrush Shrublands	Low ground cover, poor species diversity and poor age class diversity. Lacks litter or plant ground cover to minimize overland flow connections.	• Maintain sufficient residual cover in the form of plants and litter to reduce bare ground, hold soil moisture and increase native bunchgrasses: 50-70% vegetation basal cover present of which 50-70% is grass; 5-10% is forbs; 20-30% is shrubs; and 5-10% is trees as appropriate to the site potential. • Less than 10% bare ground • Up to 20% litter, 1-2" deep • Bare ground is in a discontinuous pattern so that water flow patterns are not connected • Litter, crust, or vegetation is well distributed and adequate to capture water and prevent soil movement in most places • Vigorous growth and regeneration of mid-late seral shrub species interspersed with a variety of native grasses and forbs. • Principle grass species may include Arizona Fescue, Mountain Muhly, Parry's Oatgrass, Blue Grama, or elk sedge.	Glade Allotment Long park Allotment Mair Allotment Salter Allotment
All Vegetation types but particularly pinyon-juniper	Increase of cheatgrass, musk thistle, dalmation toadflax, whitetop and	• Maintain sufficient residual cover in the form of plants, litter and biological crusts to reduce bare ground for weedy species to become established.	Brumley Allotment Calf Allotment Glade Allotment Lone Mesa Allotment

Vegetation Type/Issue	Existing Condition at Specific Locations	Desired Conditions	Allotments with Departure
and Ponderosa pine/Gambel's oak	other invasive plant species.	• Decrease populations of invasive species so that populations are small and able to be eradicated.	Long park Allotment Mair Allotment Sagehen Allotment

1.5 Forest Plan Direction

The Final Land and Resource Management Plan for the San Juan National Forest was completed in September 2013 (Forest Plan or LRMP). The Forest Plan outlines desired conditions, objectives, standards, and guidelines for general forest management and for each resource specifically. While the proposed action needs to comply with standards and guidelines in the Forest Plan, specific application to this project is found in Chapter 3 under the various resource sections and has been incorporated into the Proposed Action as design criteria, found under the description of Alternative C in Chapter 2.

Desired conditions have been outlined above and in Appendix B. Alternative A, No Permitted Livestock Grazing, would move rangelands towards Forest Plan desired conditions but would not meet the purpose and need to maintain sustainable livestock operations. Alternative B, Current Permitted Grazing and Management, meets some Forest Plan desired conditions at some locations and is not meeting or moving towards desired conditions in other locations. Alternative C, Proposed Action with Adaptive Management, is consistent with forest Plan direction, meets Forest Plan desired conditions and meets the purpose and need.

Five Management Areas in the Forest Plan have been used to define the Glade landscape (LRMP Pgs. 183-184). They are as follows:

<u>Management Area 2: Special Areas and Designations</u>
(LRMP Pgs. 185, 203-205, 222-225, 234-236).

Narraguinnep Research Natural Area (RNA): RNAs are national forest lands designated in perpetuity for non-manipulative research and education, and for the preservation of biodiversity. They are part of a long-term national network of ecological reserves managed to allow natural ecological processes to proceed with minimum human intervention. RNAs represent relatively natural, unaltered ecosystems that serve as reference areas to assess the consequences of management actions on similar lands.

Dolores River Canyon: The Dolores River canyon below Bradfield Bridge is managed by the Tres Rios Field Office of the Bureau of Land Management. Much of the Glade landscape lies above the Dolores Canyon rim and drains into the Dolores River. The stretch of the river below Bradfield Bridge is suitable for inclusion into the National Wild and Scenic River System. Outstandingly Remarkable Values includes whitewater boating, sandstone cliffs, fish and wildlife, geology, ecology, and cultural resources.

McPhee: The McPhee area includes the Anasazi National Register Archaeological District and McPhee Dam. This location was identified as a 'Special Area' because of the high density of archaeological sites, outstanding recreation, and because of dinosaur fossils. While the protection and preservation of archaeological and paleontological sites is emphasizes, the area is also managed for recreation opportunities and protecting big game winter range and sage-grouse habitat.

Management Area 3: Natural Landscapes with Limited Management
(LRMP Pg. 186)

Lone Mesa Allotment, north side Brumley Allotment, and most canyons: Management Area 3 lands are relatively unaltered places where natural ecological processes operate primarily free from human influences. Management activities are allowed on Management Area 3 lands but are more limited because they are often also in Colorado Roadless Areas. Most Management Area 3 lands emphasize non-motorized recreation opportunities and do allow livestock grazing.

Management Area 4: High-Use Recreation Emphasis
(LRMP Pgs. 187)

Lone Dome River Corridor: These areas often provide access to popular destinations, transportation corridors, scenic byways, scenic vistas, lakes and streams. These areas tend to be altered by human activities and allow for livestock grazing, timber management and wildlife management in conjunction with surrounding recreation and scenic objectives.

Management Area 5: Active Management
(LRMP Pgs. 187-188)

Most of the Glade landscape: These lands emphasize multiple use where active management occurs in order to meet a variety of social, economic, and ecological objectives. Timber harvesting, oil and gas activities and intensive livestock grazing occur on these lands and influence vegetation patterns.

Management Area 8: Highly Developed Areas
(LRMP Pgs. 189-190)

McPhee Dam: These areas have been altered with long-term development such as large dams. Human activities have created long-lasting changes which often provide large socio-economic benefits.

1.6 Decision Framework

This Environmental Impact Statement documents the analysis of the Proposed Action and alternatives. The District Ranger of the Dolores Ranger District is the Responsible Official for this project and will decide:

1. Whether to continue authorizing livestock grazing on all, none, or some portions of the eight allotments being analyzed. If none, then the No Grazing Alternative would be chosen; if so, in what manner including whether or not to implement specific actions immediately, or over time through adaptive management;
2. If livestock grazing is authorized, whether to continue the current grazing program (Current Permitted Alternative) or to implement a change as defined by the Proposed Action Alternative; and
3. What design criteria, adaptive management options, and monitoring would be required.

The decision is based on a consideration of the area's existing resource conditions, desired conditions, environmental issues, and the environmental effects of implementing the various alternatives. The District Ranger may select any of the alternatives analyzed in detail, may combine actions from the various alternatives, or modify an alternative, as long as the resulting effects are within the range of effects displayed in this document.

This document is not a decision document. Rather, it discloses the environmental consequences which may occur if the Proposed Action or alternatives to that action are implemented. A Record of Decision (ROD), signed by the Dolores District Ranger, will document the decisions made as a result of this analysis. Should the decision result in cattle grazing, any and all grazing practices adopted and within the scope of this analysis would be further detailed in the terms and conditions of new Allotment Management Plans (AMP) and grazing permits for each grazing allotment.

1.7 Proposed Action

The *overall* Proposed Action for the Glade landscape would be to authorize the grazing of livestock on the stated allotments in a manner that would meet or move toward desired conditions in defined timeframes. Adaptive management principles would guide management as specified in the analysis and decision. A list of applicable laws, regulations and plans that this project is in accordance with is found in Appendix C.

Each allotment would be permitted for specific dates and livestock numbers, (total permitted AUMs). Should long-term trend data show an allotment is functioning at desired conditions or clearly moving towards desired conditions, AUMs may be increased up to 20% on years where above average forage is produced. Utilization of this "extra" forage would not impact the condition of the allotment. Therefore, a range of dates and AUMs is provided for the Proposed Action.

Permitted livestock grazing would occur between May 10 and November 10 for no more than 21,628 AUMs within the defined project area including the defined criteria. These dates represent the maximum range of time grazing could occur under a Term Grazing Permit and the AUMs represent the maximum possible use. Actual permitted AUMs would average 18,023 AUMs.

The specific proposed actions described in Appendix B vary by allotment and are specific to the resource situation within each allotment. Specific starting point management outlined in the *Proposed Action* would be implemented within the first 3-5 years following the decision and include the design criteria listed under the description of Alternative C in Chapter 2. Should monitoring and analysis consistent with this decision show that desired conditions are not being met or conditions are not moving toward desired conditions, then *Adaptive Management* options may be implemented

The following actions would be implemented should monitoring show that proposed actions are not moving the Glade landscape towards desired conditions within defined timeframes.

- Within specific *pastures*, reduce number of days initially by 10%. In subsequent years, if allowable use levels cannot be met, continue to reduce days until specified levels are reached
- Rest pastures for an entire grazing season one out of every 3 years
- To increase ground cover for wildlife and watershed purposes, utilization criteria in parklands may be changed so that spring use does not exceed 40% and fall use does not exceed 30% or 4 inches stubble height, whichever occurs first
- Reduce numbers and/or season in the *allotment* by 10%. In subsequent years, if allowable use levels cannot be met, continue to reduce days until specified levels are reached

Allotment	Proposed Action	Adaptive Mgmt. Action
Brumley	Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of May 20 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 4,174 AUMs; Term Grazing Permit at time of decision would authorize 590 cattle 5/20-10/30 (Stocking Rate: 7.8 Acres/AUM- Moderate). Operate under a combination rotation/rest-rotation grazing system. Rotate full rest between Plantation/Black Snag and between Near Draw/Far Draw two out of five years and/or use before August so that recovery can occur prior to winter and spring runoff period	• Reduce use in Black Snag pasture to no more than 15-20 days • Combine small pastures
Calf	Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 2,295 AUMs; Term Grazing Permit at time of decision would authorize 348 cattle 6/1-10/30 (Stocking Rate: 3.86 Acres/AUM- High). This allotment would operate under a rotation grazing system. On years where Salter Canyon cannot be used due to a lack of water, the loss of use would not be place on other pastures.	
Glade	Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of June 1 and the	• Reduce Beef Pasture

Allotment	Proposed Action	Adaptive Mgmt. Action
	latest off-date of October 16 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 2,756 AUMs; Term Grazing Permit at time of decision would authorize 460 cattle 6/1-10/16 (Stocking Rate: 6.53 Acres/AUM- Moderate). Operate under a rotation grazing system. Reduce horse use in horse pasture to begin no earlier than July 1st.	use to no more than 20 days • Glade pasture used before 9/1 two out of five years • Establish stubble height requirements stricter than Forest Plan for Glade Creek to allow for riparian vegetation establishment
Lone Mesa	Proposed Action is for the addition of 20 cow/calf units with current permitted dates, resulting in an increase in 125 AUMs for a total of 558 AUMs. Operate between the earliest on-date of May 21 and the latest off-date of October 10 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 558 AUMs; Term Grazing Permit at time of decision would authorize 90 cattle 5/21-10/10 (Stocking Rate: 7.2 Acres/AUM- Moderate). Operate under a rotation grazing system. To provide rest for Hunt Creek pasture, which is the first pasture used every spring, manage for either lighter use (no more than 30%) 1 out of 3 years or use different parts of the pasture first every year (through herding, use the west side first one year, the east side first the second year). Hunt Creek pasture is currently showing improvement.	• Build a total rest into the Hunt Creek pasture 1 out of 3 years which would become part of the regular rotation cycle
Long Park	Proposed Action is for a reduction in livestock number from 450 to 300 with no change in current permitted dates. This would result in a reduction of 202 permitted AUMs. This is not a reduction in Actual Use (what has been run currently). Operate between the earliest on-date of June 1 and the latest off-date of October 25 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 1,914 AUMs; Term Grazing Permit at time of decision would authorize 300 cattle 6/1-10/25 (Stocking Rate: 5.5 Acres/AUM- High). Operate under a rotation grazing system. Divide Ormiston Point into two pastures once water sources are secured in both. Once divided, rotate the divided Ormiston pasture as entry pastures each year.	• Totally rest the Ormiston pasture 1 out of 3 years until it becomes divided
Mair	Proposed Action is for a reduction in permitted numbers from 650 to 550 with no change in the current permitted dates. This would result in a reduction of 659 permitted AUMs. This is not a reduction in Actual Use (what has been run currently). Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 3,627 AUMs; Term Grazing Permit at time of decision would authorize 550 cattle from 6/1-10/30 (Stocking Rate: 7.5 Acres/AUM- Moderate). Operate under a rotation	• Adjust on date from 6/1 to 6/10

Allotment	Proposed Action	Adaptive Mgmt. Action
	grazing system. Where multiple ponds exist within a single drainage, remove one pond per drainage where livestock continually trail back and forth between ponds and prevent riparian areas from moving towards desired conditions. Water may be developed elsewhere in the pasture if needed. Build gap fences between Big Water and Wild Bill pastures to prevent livestock from straying back onto Big Water Spring area. Plan rotations to avoid livestock return to Big Water pasture. Use Big Water Pasture like Glade, travel through early in the season and don't actually use it until the fall. Continue to rotate Wolf Den and Pole Canyon as spring entry pastures.	
Sagehen	Proposed Action is for no change in current use. Sagehen Allotment would not be operated under a Term Grazing Permit. The Sagehen Allotment boundary would be adjusted to accommodate use by Calf permittee. Otherwise all portions of the allotment except for Sagehen parkland, below McPhee Dam, and administrative site use, would be closed to livestock grazing. Those areas remaining open would allow livestock trailing to continue, administrative use by USFS stock, as well as periodic grazing for vegetation management purposes (i.e. plant seed, remove litter, reduce noxious weeds, etc.). The primary function	
Salter	Proposed Action is for no change in current permitted dates, numbers or AUMs except for the removal of one weeks' time due to private land fencing plus late entry one out of three years when the first pasture is rested. Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 2,643 AUMs; Term Grazing Permit at time of decision would authorize 2 out of 3 years for 420 cattle 6/1-10/23 (2,643 AUM; Stocking Rate: 4.0 Acres/AUM- High) and 1 out of 3 years for 420 cattle 6/22-10/23 (2,260 AUM; Stocking Rate: 4.7 Acres/AUM- High). Operate under a rotation grazing system. Haul water when Ferris Reservoir drops below a designated level. To determine that level, a staff gauge would be placed at the deepest point in Ferris Reservoir. Levels would be mapped in association with extent of water/wetland. When the wetland shoreline drops below a specified threshold (where the drop results in a substantial reduction in the wetland footprint), the water level would be noted as the level to be monitored for requiring water hauling. Willow Draw and Ferris pastures would be completely rested 1 out of 3 years. Water-lot Horse Tooth Reservoir to postpone cattle entry into that portion of Ferris pasture.	• Fence Cabin and/or Dry Lake Reservoirs with cattle access to water via a water-lot. Manage use like Ferris Reservoir to determine necessity for water hauling

1.8 Public Involvement

A project initiation letter was signed for analyzing eight allotments on the Glade landscape on August 19, 2013 by Derek Padilla, District Ranger for the Dolores Ranger District. The interdisciplinary team worked for almost two years completing the background analysis according to the National Forest Management Act (NFMA).

The Glade Range Analysis has been listed in the Schedule of Proposed Actions (SOPA) since April 8th, 2014. Although grazing permittees affected by this analysis were involved early, public scoping officially began on June 4, 2015 when the Notice of Intent (NOI) to publish an EIS was published in the Federal Register. At that time a scoping package including maps were placed on the Forest Service website with an electronic comment form. Public scoping ran for 30 days ending on July 6, 2015, although comments continued to be submitted and accepted after that date. During public scoping, 36 scoping packages were mailed or emailed to interested citizens, a letter announcing the project and providing weblinks was mailed to 30 landowners, and scoping documents were emailed to congressional staff. A Public Service Announcement was sent to media outlets on June 9, 2015. Media contacts included the Cortez Journal, Dove Creek Press, Dolores Star, Durango Herold, and local radio stations. A newspaper article about the project was published on June 15 and July 19, 2015 in the Cortez Journal and July 23, 2015 in the Dolores Star, respectively. Twenty comment letters were received via mail, email, and the website comment form. Native American Tribes were initially notified of this project during the annual Tribal consultation meeting in August 2014 held at the Anasazi Heritage Center, Dolores, CO. The Glade project was presented for discussion with the Colorado Parks and Wildlife on April 28, 2015. The Montezuma and Dolores county commissions were briefed regarding the Glade Range Analysis throughout 2014. A meeting with the Dolores County Commission went into more depth on June 15, 2015. A field trip was held with the Montezuma County Commission on July 16, 2015 in which 20 individuals including county commissioners, the county planner, grazing permittees both on and off the Glade, and USFS officials were in attendance. A conference call took place with John Ratner of Western Watersheds Alliance on July 21, 2015.

1.9 Public Concerns and Issues

Approximately 20 comments were received during the scoping period. The Council on Environmental Quality Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act is found at 40CFR1500-1508. This regulation includes the following, “There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. …As part of the scoping process the lead agency shall: … Determine the scope and the significant issues to be analyzed in depth… [and] identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review, …” 40CFR1501.7.

Comments were divided into public concerns and issues. Public concerns were not used in the development of alternatives and in some cases may be outside the scope of this analysis. Issues serve to highlight effects or unintended consequences that may occur from the proposed action and alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision-maker and public to understand. Issues were used to develop alternatives and were analyzed as part of that alternative.

1.9.1 Public Concerns

#	Public Concern	How Addressed
1	A person that recreates in the Glade area commented that cattle grazing degrades vegetation	No specific link was made by the commenter on what the affect to recreation might be. Although vegetation is altered as a result of livestock grazing, it remains natural appearing and does not restrict access for recreation. Further, desired conditions and design criteria respond to this issue in varying ways.
2	The Proposed Action permits grazing well below fair market value – the low fee for permits undercuts private grazing operations	Grazing fees are set according to law and are beyond the scope of this analysis or the authority of the District Ranger.
3	Should recognize the good work of the permittees	Background documents in the project file summarizes positive contributions of livestock grazing management.
5	Proposed Action proposes to recover plant species in areas where species can't grow	The intent of the Proposed Action is to manage for species appropriate to each vegetation type that have been found on the Glade landscape. Areas of recovery show the species and recovery that is possible. See the NFMA (National Forest Management Act) document for more information.
6	Should conduct big game monitoring in Lone Mesa Allotment	Cattle browsing of forbs and shrubs has not been identified as a problem to date in the Lone Mesa Allotment (conflict with deer). Over-utilization of grass species has also not occurred (conflict with elk). Coordination takes places between Colorado Parks and Wildlife and the US Forest Service if/when competition for scarce resources occurs, at which time monitoring may be implemented.
7	Take photos during monitoring	Photos are a regular part of range transect monitoring, Properly Functioning Condition assessments, and other monitoring methods.
8	The Proposed Action is silent about retreating existing nonstructural improvements. Need statement that it is desirable to do so	A statement exists within the Proposed Action about the desire to retreat existing nonstructural improvements. The background documents for each allotment describe past nonstructural treatments. See Appendix B.

1.9.2 Issues

#	Issue	How Addressed
1	The Proposed Action lacks a detailed description of benchmark sites such as locations, short term vs long term items to monitor, what to look for and what key species should be monitored. Need to work with permittees to establish. Monitoring should use a range of use on key species.	Appendix B outlines the specific key sites where monitoring will occur. Monitoring is important, particularly when implementing adaptive management. Greater detail will be placed in Allotment Management Plans (AMPs).
2	In wet years the Mair Allotment may be able to support current permitted	This issue is discussed in Chapter 3 of this DEIS. Likely precipitation levels and possible future climate scenarios

#	Issue	How Addressed
	numbers so should not be reduced.	have been analyzed. This DEIS explains in detail that the permit can be written to allow for a range of permitted AUMs and annual authorized use depending on both weather and allotment conditions.
3	The Proposed Action calls out the possibility of pond closure in drainages on the Mair Allotment. Closing ponds would lose the previous investment by the permittee of constructing ponds, plus there would be a reduction in water for wildlife. Pressure would be placed on other ponds.	This issue is discussed in Chapter 2 under Proposed Action for the Mair Allotment and explains the specific situation where having multiple ponds in a single drainage may cause livestock to trail up and down the riparian area, not allowing it to meet desired conditions. Potential pond closures would take the concerns mentioned under consideration so that wildlife and livestock water sources are still provided.
4	The Proposed Action notes cattle trailing not desirable in riparian areas. This is not always true and there are benefits to trails for wildlife, hunters, etc.	This issue is discussed in Chapter 2, design criteria number 2.7.23 as well as the impact analysis section.
5	30% in Mtn. grasslands may not be achievable because requires a lot more effort to keep cattle out of the grasslands. Also difficult when water is located in meadows.	This DEIS discusses the extra effort required to implement use requirements in mountain grasslands. Although extra effort is required, the proposal is within reason and should not cause major effects to livestock operations for any of the permittees.
6	30% fall use in Mtn. grasslands may be too low because research shows that utilization at 40% yields the same or similar results as 30%. i.e. going lower than 40% does not achieve any additional benefit – another commenter said that 50% should be sufficient.	This topic is discussed under the description of the Proposed Action Alternative in Chapter 2.
7	Under the Proposed Action it appears most of the burden for achieving improvements is placed on the permittees	The burden to permittees and effects to cattle operations is described in this DEIS in Chapter 2, alternative description and in Chapter 3, effects analysis.
8	The Proposed Action prescribes a full time rider and this may or may not be the best tool for achieving objectives. The USFS should not prescribe how to accomplish objectives but rather leave that choice to the permittee.	This issue resulted in a refinement to the Proposed Action to remove the requirement for a full time rider. Instead objectives for use are established and where needed use mapping will be accomplished. Permittees may choose any method they want within the scope of the analysis and stated design criteria to achieve objectives (salting, water hauling, riding, etc.).
10	Under the Proposed Action there are no vacant pastures to help with response to wildfire. This means that in the event of wildfire reductions may be necessary in the short term.	This statement will be carried forward into this DEIS. An alternative to provide a vacant pasture was considered but not carried forward because of the impact to grazing operations and the lack of an available and suitable forage reserve allotment within a reasonable distance.
11	The 35% riparian/woody species utilization is not achievable because riparian recovery is subject to weather and different by allotment. Should not apply one use requirement everywhere.	This is a Forest Plan guideline that is incorporated in this Chapter under Step 7 of the process used to develop alternatives.

#	Issue	How Addressed
12	Monitoring should occur after the end of the grazing season so that regrowth can be noted.	This is discussed under the monitoring section for the Proposed Action in Chapter 2.

In addition to public issues, the interdisciplinary team identified the following key issues:

#	Issue	How Addressed
1	Poor conditions of specific springs, seeps, and riparian areas	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.
2	Certain Swales have poor plant species composition with little riparian vegetation and in some locations bare banks	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.
3	In specific areas there is a lack of litter, crusts, and mat-formation vegetation to minimize overland flow connections	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.
4	Certain mountain grassland parks display a lack of native bunchgrasses, poor species composition and high percentage of bare ground	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.
5	Mountain shrublands and sagebrush shrublands improving but still has low ground cover, poor species diversity and poor age class diversity	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.
6	Need to actively manage the increase and spread of cheatgrass, musk thistle, white top and Russian knapweed and other invasive species	Addressed in Alternative C - Proposed Action, analyzed under effects in Chapter 3.

1.10 Process Used to Develop Alternatives

The following paragraphs describe the steps performed in this analysis and ultimately how the proposed alternative was developed. For more in-depth information on this process please see Appendix D, NFMA Report.

Assumptions for this work include:

1. There is a close link between soil structure, hydrologic function, precipitation (i.e. weather patterns) and vegetation. This analysis focused on the concept of how the land functions, and how to maintain that function.
2. An overriding theme in these discussions was to maintain the ability of the land to withstand fluctuations in weather and be resilient while anticipating drying trends with or without increased precipitation events. A primary assumption is that dry periods are a new 'normal' for this landscape and no longer just a periodic cyclic event.

3. Themes described in the San Juan Land and Resource Management Plan include the lands ability to be resilient to changes in temperature and/or precipitation and its ability to move towards, not away, from desired conditions.
4. It is important to understand the potential of a site in order to set realistic goals for desired future conditions. For example, expecting deep rooted native bunchgrasses to grow in shallow soils is not realistic.
5. An ecosystem that functions with resiliency consistently provides a variety of benefits such as clean water, livestock forage, wildlife habitat, watershed health, etc.
6. The mature condition of tree and shrub communities across the Glade landscape is not expected to change dramatically in the next 20 years. Some prescribed fire or tree/shrub cutting projects may occur but will be at a small scale. Wildfires/insect infestations have occurred in the past and will occur in the future but the size and extent has typically been small. This may change but cannot be predicted.
7. Where woody debris, plant litter and plant basal cover occur in vegetation types, vegetation and litter are the primary 'soil holders' and therefore used to describe potential conditions. Given the lack of understory vegetation often found in drier pinyon-juniper sites, potential conditions for these areas would be described in terms of water flow patterns, litter, woody debris, and cryptogamic soils.
8. Sometimes a vegetation type has already experienced a shift into another type where a "threshold" has been passed such that a return to the pre-existing condition is extremely difficult or even impossible. Our objective in these cases is to manage the current vegetation type and not try to 'go back'. Examples include parklands seeded with nonnatives, areas where sagebrush was removed, and the channel structure of Ryman and Hunt Creek.

Step 1 – Identification of Workable 'Vegetation Types'

Ecological Site Descriptions, Web Soil Surveys, FSVeg Spatial data, personal and professional knowledge, scientific literature, local site specific field data, and other sources were used to define vegetation types across the Glade landscape.

The six major upland vegetation types and nine subtypes identified within the landscape are as follows (for greater detail, please refer to Appendix D):

- Ponderosa Pine/Gambel's Oak
    - Subtype #1: Ponderosa Pine/Shortgrass/Shallow Soils/More Dry
    - Subtype #2: Ponderosa Pine/Midgrass/Shallow to Mid-Depth Soils/Medium moisture
    - Subtype #3: Ponderosa Pine/Bunchgrass/Deep Soils/Less Dry
- Mountain Grassland
    - Subtype #1: Native Parks (Deep Soils/Less Dry)

    - Subtype #2: Brome Parks (Deep Soils/Less Dry)
- Aspen
    - Subtype #1: Colorado Plateau
    - Subtype #2: Terrain-Isolated (stringers)
- Pinyon-Juniper
    - Subtype #1: Ryman Pinyon-Juniper/Shallow Soils/More Dry/Northwest Corner
    - Subtype #2: Pinyon Pine/Black Sage/Shallow Soils/Rim Country
- Mountain Shrubland/Shallow to Mid-Depth Soils/Medium Moisture/Oak and other Shrubs Dominate
- Sagebrush Shrubland

Eight riparian types were identified as follows:

- Low gradient swales/slope wetlands
- Glade Canyon
- High gradient streams
- Headwater transition zones
- Moderately steep, rocky canyons
- Low gradient, deeply incised channels
- Dolores River
- Lentic areas (Springs, Depressional Wetlands and Reservoirs)

Step 2 – Define Potential Conditions

Before looking at each allotment specifically, the ID team reviewed the landscape as a whole and discussed how the landscape functions and what its potential condition would be regardless of any type of use. Potential conditions were determined using site locations where recovery has taken place and/or benchmark areas where conditions remain relatively untouched by human/livestock influence. Many of the sources listed above including Ecological site indices, soil surveys, and literature were also used to determine if potential conditions currently exist or were capable of existing. Potential conditions were compared with existing conditions, given specific site constraints. It was then determined if current conditions matched, deviated from, and/or could return to potential conditions.

Steps 3 and 4 – Describe 'Moving Away From' and 'Moving Towards' Potential Conditions, including indicators of irreversible change

The ID team described indicators of whether a vegetation type is moving towards or away from potential condition. With this information, a grazing permittee or range manager can assess the current condition and relative trend of a site.

The team recognized that soil and site stability, hydrologic function, and biotic integrity are all components of site resiliency. They also discussed the point at which a system starts to

"unravel" or is no longer resilient to such things as prolonged drought, periodic disturbances, and current management.

Step 5 – Describe Desired Conditions

After describing potential conditions for various vegetation types it became apparent that not all areas would be able to achieve potential given such constraints as current resource management, expected grazing (wildlife and/or livestock) and changed conditions (seeding of introduced species, loss of top soil, etc.). In these cases desired conditions are resilient, given the constraints upon the vegetation type. For example, brome parklands that exist almost as a monoculture of nothing but brome, would continue to be managed for stability as a brome park. Management of grazing would have little ability to reduce the brome grass and to move the sites toward the natural potential. Cultural tools such as mechanical treatment, prescribed fire, etc. would be expensive and of limited value in altering the current setting.

Outside of brome-dominated parklands, other areas on the Glade have a predominance of nonnative plant species but also contain pockets of native species as well. It was decided in these cases that management should emphasize the expansion of native species where they exist. Native species developed under local conditions are normally better suited to provide resiliency in the ecosystem. The quagmire however is that native species are also often the most desirable forage species for domestic livestock and therefore are consumed first, giving least desirable plant species a competitive advantage. If managed properly, however, native species can expand as seen in specific locations on the Glade landscape.

Step 6 – Describe Existing Condition for each Vegetation Type for each Allotment

It was during this step in the process that the interdisciplinary team stepped down their analysis to the allotment level. Based on collected data and personal/professional knowledge of the area, existing condition was described for each allotment.

Monitoring data were evaluated by the interdisciplinary team (IDT) to measure changes in range condition on the Glade Rangeland Management Area. Data were available from approximately 38 permanent long-term monitoring transects, some established as early as 1953, using the Parker Three-Step and/or Rooted Nested Frequency methods (Forest Service Rangeland Analysis and Management Training Guide 1996). In addition, information from approximately 26 range health assessments, 19 cover frequency transects and 88 hydrologic assessments were included in this analysis. These data are described in detail in the range specialist report for each of the eight allotments.

Range health is considered satisfactory when the existing vegetation community is similar to desired condition, vegetation trends are improving or stable as appropriate, and short-term objectives are being achieved. Decreases in plant density and diversity, loss of desirable species, increases in bare ground and other factors may indicate a downward trend which could be attributable to land management practices.

Range condition is a subjective expression (very poor, poor, fair, good, and excellent) and is evaluated relative to a standard that encompasses the composition, density, and vigor of the vegetation and the physical characteristics of the soil. *Range trend* expresses the direction of change in range condition over time in response to livestock management and other environmental factors. For the management status of each allotment, please refer to the specific range specialist report (Dolores District project files).

Step 7 – Describe the Differences between Desired Condition and Existing Condition which are Opportunities or Needs for Improvement

The interdisciplinary team then started to compare desired condition with existing condition for each vegetation type within each allotment. It soon became evident that most of the vegetation types listed under Step 1 showed little difference between desired and existing conditions. However where discrepancies did occur for specific vegetation types, they occurred on most of the allotments. This narrowed the need for improvements down to a few vegetation types but the need was pretty consistent across the entire landscape.

The Table under Need for Action Section 1.4 above outlines general differences between existing and desired conditions. Although these differences were not found everywhere on every allotment, there were consistencies across the Glade landscape (Please see Appendix E for photos showing resource issues).

The purpose of the proposed action is to continue to authorize sustainable livestock grazing on all or portions of the project area while moving resource conditions from existing toward desired healthy sustainable and resilient resource conditions. The difference between existing and desired conditions is the need for the proposed action.

The interdisciplinary team brainstormed and developed a variety of management options designed to move the landscape toward desired conditions based on the issues listed in the Table above. USFS staff then met with each permittee to discuss concerns, the process used in determining these concerns, and the possible solutions that had been developed to date. The permittees were asked to come back to the USFS with options of their own on how to resolve these issues. Public scoping then outlined the process, concerns and potential solutions and asked for comments.

Step 8 – Incorporate Key Issues Identified Through Scoping in the Development of Alternatives

Public scoping was conducted and resulted in several key issues that were used to refine the Proposed Action presented during scoping. Most comments received during scoping were addressed through the analysis described in this document.

Chapter 2: Proposed Action and Alternatives

This Chapter describes and compares the alternatives considered for permitted livestock grazing management across the Glade Rangeland Management Area. It includes a description of each alternative considered in this analysis. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. The information used to compare the alternatives is based on the design of the alternative (e.g., installing additional water sources), as well as the environmental, social, and economic effects of implementing each alternative.

Three tables can be found at the end of this chapter. The first (Table 2.5) compares actions to be taken among the various alternatives carried forward in this analysis. The second table (Table 2.6) compares effects of implementing the various alternatives as they respond to issues. The third table (Table 2.7) compares effects of the various alternatives as they respond to other components of the purpose and need.

2.1 Alternatives Considered but Not Carried Forward for Detailed Analysis

Federal agencies are required by NEPA to explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

2.1.1 Combine Allotments

Several scenarios for combining allotments were considered when looking at issues across the Glade landscape. In one case, Calf and Salter allotments would have been joined into one allotment. This alternative would have provided several benefits such as allowing each operator to change their rotation each year, preventing livestock entry into the same pasture as the first pasture every year, allowing operators to combine efforts in hiring a full-time rider to keep livestock distributed, and providing the opportunity to move through pastures faster preventing grasses from being grazed repeatedly and allowing for longer recovery periods.

However, when presented to the permittees involved, it became evident that it would not work for their operations which usually involved separate breeding programs each having specific bulls they wanted to breed their cows. It also enlarged the number of livestock operating as a herd to the point that one full-time rider may not have been enough, even with periodic assistance from the permittees. Also, in most cases, moving livestock down in elevation in the fall could result in them pushing to go home which would not work without additional fencing and help. The logistics of managing this scenario rendered this alternative not feasible.

2.1.2 Manage Sagehen Allotment through a Term Grazing Permit

The Sagehen Allotment has never been managed under a Term Grazing Permit. It was originally established with an emphasis on cultural resource protection and big game winter range. Much of the allotment consists of steep side canyons and McPhee Reservoir, both of which are not suitable for livestock grazing. Current livestock uses are compatible with management

objectives for the Sagehen Allotment and include providing a stock driveway to and from other allotments on the Forest, and occasional livestock use for vegetation management purposes. Managing Sagehen Allotment under a Term Grazing Permit would likely establish a conflict in uses and priorities. In addition, it would require considerable fencing and stock pond construction. As it is, stock ponds currently existing on Sagehen Allotment do not have water during most of the grazing season.

2.1.3 Move All Stock Ponds Out of Parklands

It was decided that moving all stock ponds is cost prohibitive, although certain selected ponds may be considered for relocation. This alternative was suggested during the fieldtrip with permittees and the Montezuma County Commissioners. The objective of this alternative would be to minimize the draw of livestock to parklands where the bulk of use and environmental impacts is occurring. This was not an issue in the 1940-1960s, when most stock ponds were constructed.

Currently it is estimated that approximately 92 stock ponds are located within parklands across the Glade landscape. In order to move these ponds, another location would need to be located in wooded/shrubland areas and an environmental assessment completed. Engineers would be required to determine if water runoff is sufficient to supply a pond. Cultural and wildlife surveys would need to be conducted and in many cases, timber removed. The construction of the pond itself would require engineer over-sight, and include an outlet, seeding of disturbed areas, and the acquisition of water rights. The original pond would need to be filled in and reclaimed. The total cost for each pond removal and replacement would be approximately $5,000. That amount times the total number of ponds equates to approximately $460,000.

2.1.4 Provide a Forage Reserve Allotment

The concern arose during public scoping that should a permittee need to move his livestock due to a wildfire, drought, or other negative circumstance, he/she has nowhere to go on the Glade landscape. With the exception of the Sagehen Allotment, This statement is true because there are currently no vacant allotments in the vicinity. Should a wildfire or some other circumstance require a reduction in AUMs, it would be the permittee's responsibility to find alternative forage. The Sagehen Allotment has never been operated under a Term Grazing Permit. It was specifically established as wildlife mitigation for McPhee Reservoir and as an archaeological district. While livestock are allowed to trail through portions of the allotment and this DEIS proposed to allow livestock grazing for vegetation improvement purposes, no additional grazing is being considered because of the above mentioned priorities. In order to provide a forage reserve allotment on the Glade, an allotment currently under a Term Grazing Permit would need to be vacated.

2.2 Alternatives Considered and Analyzed in Detail

Three alternatives were carried forward for further analysis in this document and include:

- Alternative A: No Permitted Livestock Grazing

- Alternative B: Current Permitted Grazing and Management (i.e. No Action)
- Alternative C: Proposed Action with Adaptive Management

It was felt that slight variations on these alternatives did not warrant the development of a new alternative since effects would be included in the analysis of these three alternatives.

2.2.1 Alternative A - No Permitted Livestock Management

Alternative A would not permit livestock grazing across the Glade Rangeland Management Area. Domestic livestock may be authorized to graze for vegetation management purposes only (noxious weed control, brush management, etc.). This alternative does not preclude permitted livestock grazing in the future following a separate analysis and a decision made by the Responsible Official.

The discontinued livestock grazing under this alternative would require that active Term Grazing Permit issued to current permittees be cancelled. Permittees would be given a 2-year or more notification, after which their permits would be cancelled. Maintenance of range improvements by grazing permittees would not be required after permit cancellation. There would be no need to apply Forest Plan standards and guidelines for livestock grazing to the area. Range improvements would be evaluated and those not beneficial to other resources would be removed.

Alternative A meets the purpose and need of maintaining and/or improving vegetation and soil conditions but it does not maintain viable livestock operations by authorizing livestock grazing on the glade landscape.

2.2.2 Alternative B - Current Permitted Grazing and Management (No Action)

The Forest Service requires that a “No Action” (i.e. continuation of current management) alternative be analyzed in detail (FSM 2209.13, 92.31). The Forest Service Grazing Permit Administration Handbook (FSH 2209.13) states that current management should be analyzed in detail as an alternative to the Proposed Action (Chapter 92.31). This alternative maintains current livestock grazing management practices, permitting a maximum of 19,568 AUMs between the season dates of May 20 and October 30. There would be no change in permitted numbers of livestock, permitted season of use, kind or class of livestock, current rotation patterns, or other allotment administration (other than minor changes made, by exception, in the AOI). There would be a maximum 45% utilization criteria for rotation grazing systems (as per the Forest Plan) with no further restrictions for site-specific locations. Very few if any new range structures would be constructed with the focus of maintaining existing structures. Range structure inventories would continue.

Key areas would be identified for monitoring with the current level of spot use-mapping and long-term trend monitoring occurring. Permittees would continue to be responsible for monitoring allowable use criteria with USFS spot checking. Standard administrative actions would be implemented should allowable use be exceeded. Desired conditions are general statements in the Forest Plan with no allotment-specific objectives identified. No triggers for adaptive management would be in place for the allotments being analyzed.

Alternative B meets the purpose and need of maintaining current vegetation and soil conditions in some areas, but allows other areas to decline in range health or to remain in less than desirable condition, while maintaining viable livestock operations by authorizing livestock grazing on the Glade landscape.

2.2.3 Alternative C –Proposed Action with Adaptive Management

This description MUST BE read with Appendix B. The Proposed Action as described here, reflects improvements based on public comments received during the scoping period and concerns of the interdisciplinary team. Appendix B provides more in-depth descriptions of issues, desired conditions, objectives, and adaptive management actions proposed for each allotment.

Proposed Action

Each allotment would be permitted for specific dates and livestock numbers, (total permitted AUMs). Should long-term trend data show an allotment is functioning at desired conditions or clearly moving towards desired conditions, AUMs may be increased up to 20% on years where above average forage is produced. Utilization of this "extra" forage would not impact the condition of the allotment. Therefore, a range of dates and AUMs is provided for the Proposed Action.

This alternative permits a maximum of 21,628 AUMs between the season dates of May 10 and November 10. These dates represent the maximum range of time grazing could occur under a Term Grazing Permit and the AUMs represent the maximum possible use. Actual permitted AUMs would average 18,023 AUMs.

The maximum 45% utilization criteria for rotation grazing systems would remain, unless otherwise specified to be more restrictive. To increase ground cover for wildlife and watershed purposes, utilization criteria in parklands is proposed to change so that spring use does not exceed 40% and fall use does not exceed 30% or 4 inches stubble height, whichever occurs first. 40% utilization maintains the vigor and viability of plants. The 30% fall use was proposed to provide additional litter and residual plant cover for small wildlife species and watershed protection. Litter is an important component of reaching desired conditions in the mountain grasslands. We have also provided a stubble height restriction which can meet the same objective.

The first pasture entered every spring would rotate or be rested 1 out of 3 years. The focus would be on maintaining existing range improvements with very few new range structures constructed. Water would be properly developed and maintained where needed, protecting other sources where not needed (these may include new pond construction, closure or water-loting existing ponds, hauling water or other methods). At least 2 springs would be improved to current design criteria (standards) every year where opportunities to protect and/or improve sites are known to exist. An inventory of all springs, seeps, and ponds would be conducted with additional springs being improved as funding allows. As opportunities and funding permit, existing vegetation treatments that promote improved ground cover and increased native desirable plant species would be maintained (additional clearances would be needed prior to

implementation). Weed inventory, treatment and monitoring would continually be performed under the existing Invasive Species Action Plan (2012). In summary, proposed actions to address issues with selected springs include:

- Implement Forest Plan stubble height restrictions in riparian areas
- Adjust rotations for some allotments (see Appendix B)
- Apply 40/30% use restrictions in specific areas
- Apply 45% use in other areas
- Construct new ponds in some allotments (see Appendix B)
- Map use on three allotments and adjust use accordingly
- Add a pasture breaks in selected areas (see Appendix B)
- Remove pond(s)

Desired condition statements would be adopted which refine Forest Plan desired conditions to be specific to the Glade landscape. Forest Plan standards for stubble height in riparian areas would be met (see page 71 Table 2.7.2 in Forest Plan). Permittees would monitor stubble height with spot checks by USFS. Livestock management as currently operated in the Lone Mesa and Long Park allotments would continue since these allotments are meeting Forest Plan standards for stubble height in riparian areas and showing signs of improvement.

Key monitoring sites would be identified in cooperation with permittees and represent the vegetation type most sensitive to impacts from livestock grazing within each pasture. Permittees would remain responsible for monitoring allowable use criteria with USFS spot checking. Monitoring of use would continue to occur directly following pasture use and in some cases at the end of the grazing year (i.e. residual riparian vegetation height). There is an option to monitor at the end of the grazing season rather than right after a pasture is used. This option was considered but not carried forward because 1) given current drought conditions recovery has not been taking place after livestock have left a pasture, 2) we are seeking the added benefit of more litter and cover available should recovery take place for the benefit of wildlife, watershed, and range health, and 3) visiting pastures twice is time consuming for Forest staff and permittees.

Use-mapping of allotments with distribution issues would be conducted by the USFS. This would generally involve riding through a pasture on horseback and mapping use patterns based on ocular utilization estimates. Lumping categories to simplify, we recommend use-mapping according to Table 2.1 (BLM Technical Reference 4400-3, Utilization Studies, Pages 23 and 83):

Table 2.1 Use-mapping guidelines

% Use	Use Descriptor	Description	Color
0-40%	Light	Use ranges from negligible to plants topped or grazed in patches	Green
41-60%	Moderate	Half use; 15-25% of seed stalks remain intact	Yellow
61-100%	Heavy	Ranges from more than half available forage removed, Less than 15% of seed stalks remain intact, to utilized to soil surface	Red

The route of travel and mapping would be displayed in color showing patterns of use. When 2 out of 3 years show poor distribution (for example, bulk of use in parklands and little or no use in woodland/shrub areas) then capacity would be set based on acreage of suitable range actually used. For example, a pasture that shows 1/3rd suitable acres not used while other areas in that pasture receive a disproportionate amount of use and exceed established use criteria, would be reduced in time by 1/3rd.

Since the typical proper use level for rotation grazing systems is 45%, it is beneficial to divide "moderate" into moderate/low or moderate/high. Areas repeatedly mapped as moderate/high are considered to have exceeded allowable use criteria.

Allotment Specific Management

Brumley Allotment

Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of May 20 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 4,174 AUMs; Term Grazing Permit at time of decision would authorize 590 cattle 5/20-10/30 (Stocking Rate: 7.8 Acres/AUM- Moderate) but this may change over time in response to monitoring results. Operate under a combination rotation/rest-rotation grazing system.

Rotate full rest between Plantation/Black Snag and between Near Draw/Far Draw two out of five years and/or use before August so that recovery can occur prior to winter and spring runoff period. Adaptive Management Options include: 1) Reduce use in Black Snag pasture to no more than 15-20 days; and 2) Combine small pastures.

Calf Allotment

Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 2,295 AUMs; Term Grazing Permit at time of decision would authorize 348 cattle 6/1-10/30 (Stocking Rate: 3.86 Acres/AUM- High). This allotment would operate under a rotation grazing system.

On years where Salter Canyon cannot be used due to a lack of water, the loss of use would not be place on other pastures as has been occurring.

Glade Allotment

Proposed Action is for no change in current permitted dates, numbers or AUMs. Operate between the earliest on-date of June 1 and the latest off-date of October 16 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 2,756 AUMs; Term Grazing Permit at time of decision would authorize 460 cattle 6/1-10/16 (Stocking Rate: 6.53 Acres/AUM- Moderate). Operate under a rotation grazing system.

Delay horse grazing in the horse pasture until July 1st. Adaptive Management Options include: 1) Reduce Beef Pasture use to no more than 20 days; 2) Glade pasture used before 9/1 two out of five years; and 3) Establish stubble height requirements stricter than Forest Plan for Glade Creek to allow for riparian vegetation establishment.

Lone Mesa Allotment

Proposed Action is for the addition of 20 cow/calf units with current permitted dates, resulting in an increase in 125 AUMs for a total of 558 AUMs. Operate between the earliest on-date of May 21 and the latest off-date of October 10 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Use would be managed at 558 AUMs; Term Grazing Permit at time of decision would authorize 90 cattle 5/21-10/10 (Stocking Rate: 7.2 Acres/AUM- Moderate). Operate under a rotation grazing system.

To provide rest for Hunt Creek pasture, which is the first pasture used every spring, manage for either lighter use (no more than 30%) 1 out of 3 years or use different parts of the pasture first every year (through herding, use the west half first one year, the east half first the second year). Adaptive Management Options include: 1) Build a total rest into the Hunt Creek pasture 1 out of 3 years which would become part of the regular rotation cycle.

Long Park Allotment

Proposed Action is for a reduction in livestock number from 450 to 300 with no change in current permitted dates. This would result in a reduction of 202 permitted AUMs. This is not a reduction in Actual Use (what has been run currently). Operate between the earliest on-date of June 1 and the latest off-date of October 25 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 1,914 AUMs; Term Grazing Permit at time of decision would authorize 300 cattle 6/1-10/25 (Stocking Rate: 5.5 Acres/AUM- High). Operate under a rotation grazing system.

Divide Ormiston Point into two pastures once water sources are secured in both (requires new pond construction). Once divided, rotate the divided Ormiston pasture as entry pastures each year. Adaptive Management Options include: 1) Totally rest the Ormiston pasture 1 out of 3 years until it becomes divided.

Mair Allotment

Proposed Action is for a reduction in permitted numbers from 650 to 550 with no change in the current permitted dates. This would result in a reduction of 659 permitted AUMs. This is not a reduction in Actual Use (what has been run currently). Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 3,627 AUMs; Term Grazing Permit at time of decision would authorize 550 cattle from 6/1-10/30 (Stocking Rate: 7.5 Acres/AUM- Moderate). Operate under a rotation grazing system.

Where multiple ponds exist within a single drainage, remove one pond per drainage where livestock continually trail back and forth between ponds and prevent riparian areas from moving towards desired conditions. Water may be developed elsewhere in the pasture if needed. Build gap fences between Big Water and Wild Bill pastures to prevent livestock from straying back onto Big Water Spring area. Plan rotations to avoid livestock return to Big Water

pasture. Use Big Water Pasture like Glade, travel through early in the season and don't actually use it until the fall. Continue to rotate Wolf Den and Pole Canyon as spring entry pastures. Adaptive Management Options include: 1) Adjust on date from 6/1 to 6/10.

Sagehen Allotment

Proposed Action is for no change in current use. Sagehen Allotment would not be operated under a Term Grazing Permit. The Sagehen Allotment boundary would be adjusted to accommodate use by Calf permittee. Otherwise all portions of the allotment except for Sagehen parkland, below McPhee Dam, and administrative site use, would be closed to livestock grazing. Those areas remaining open would allow livestock trailing to continue, administrative use by USFS stock, as well as periodic grazing for vegetation management purposes (i.e. plant seed, remove litter, reduce noxious weeds, etc.). The primary function of the Sagehen Allotment is for wildlife habitat and archeological resource protection.

Salter Allotment

Proposed Action is for no change in current permitted dates, numbers or AUMs except as described below. Operate between the earliest on-date of June 1 and the latest off-date of October 30 (based on weather and resource conditions); utilize a mix of cattle (cow/calf, yearlings, bulls). Permitted use would be managed at 2,643 AUMs; Term Grazing Permit at time of decision would authorize 2 out of 3 years for 420 cattle 6/1-10/23 (2,643 AUM; Stocking Rate: 4.0 Acres/AUM- High) and 1 out of 3 years for 420 cattle 6/22-10/23 (2,260 AUM; Stocking Rate: 4.7 Acres/AUM- High). Operate under a rotation grazing system.

Haul water when Ferris Reservoir drops below a designated level. To determine that level, a staff gauge would be placed at the deepest point in Ferris Reservoir. Levels would be mapped in association with extent of water/wetland. When the wetland shoreline drops below a specified threshold (where the drop results in a substantial reduction in the wetland footprint), the water level would be noted as the level to be monitored for requiring water hauling. Willow Draw and Ferris pastures would be completely rested 1 out of 3 years. Water-lot Horse Tooth Reservoir to postpone cattle entry into that portion of Ferris pasture. Adaptive Management Options include: 1) Fence Cabin and/or Dry Lake Reservoirs with cattle access to water via a water-lot. Manage use like Ferris Reservoir to determine necessity for water hauling.

Design Criteria

Design criteria are sideboards established that must be enacted as part of an alternative. Analyses assume these criteria are in place and describe impacts accordingly. The following Forest Plan guidelines were reviewed and are being applied to all allotments as design criteria for the Proposed Action [with further interpretation for this analysis]. The numbers below refer to the criteria number in the Forest Plan.

1. (LRMP 2.4.25) Livestock browsing should not remove more than 25% of the annual leader growth of hydrophytic (water-dependent) shrubs and trees [this will be determined through monitoring and livestock removed once browsing limits are reached].

2. (LRMP 2.7.18) Grazing systems should be designed in a manner to provide periodic rest to forage species during the critical growing season in order to promote species diversity, reproduction, and productivity [if the first pasture entered in the spring is the same pasture every year, then it receives rest 1 out of 3 years].
3. (LRMP 2.7.19) Livestock grazing should be avoided during the same time, and in the same place, in consecutive years on National Forest System lands.2.7.22 Grazing management activities should be modified in, or livestock excluded from, riparian areas that are "nonfunctional" or "functional-at risk" with a downward trend (as rated by the Proper Functioning Condition protocol), where livestock have been determined to be a key causative agent.
4. (LRMP 2.7.23) Trailing of livestock should be avoided along riparian areas to the extent practicable.
5. (LRMP 2.7.27) Livestock should be moved from the grazing unit or allotment when utilization criteria on key areas are met or exceeded, as identified in Table 2.2, or as specified in a NEPA decision for the particular allotment's AMP or annual operating instructions.

Table 2.2 Allowable Use Criteria by Livestock Grazing Management System [Unless otherwise specified to be more restrictive]

Management System	Allowable Forage Utilization Criteria*
Rotation	45%
Deferred rotation	50%
Rest rotation	50%
* Utilization percentages are expressed in terms of annual forage production present at the time the livestock leave the area and are generally a measurement of designated key species on key areas.	

6. (LRMP 2.7.31) Project planning should consider the need to retreat non-structural range improvements.
7. (LRMP 2.7.33) Where appropriate, and where the appropriate kind and class of livestock are available, livestock grazing should be considered as an invasive species management tool. [Use of sheep, goats or other non-permitted animals on this landscape may occur on a site specific basis after complete analysis as a tool for vegetation management such as the control of noxious weeds, Gambel's oak, mule's ear (*wyethia*), or other plant species].
8. (LRMP 2.7.28) The residual riparian vegetation guidelines, as shown in Table 2.3, should be met or exceeded at the time livestock leave the pasture/allotment.

Table 2.3 Post-grazing Vegetation Heights under Different Seasons of Use in Riparian Areas and Wetlands

Season of Use	Residual Riparian Vegetation Height*
Early growing season (i.e., significant regrowth potential)	3 inches
Mid-season (i.e., limited regrowth potential)	4 inches
Late season (i.e., little to no regrowth potential)	4–6 inches
Late fall and winter (i.e., dormant season use)	6 inches

* Maximum riparian and wetland allowable use (residue) criteria to be applied on key sedge or rush species. For riparian areas lacking sedge and/or rush species, use existing herbaceous vegetation utilization criteria. Consider the duration livestock has access to key areas when setting allowable use criteria—the shorter the duration, the less the opportunity for repeat grazing of individual plants.

Additional design criteria developed as part of the Proposed Action include the following:

9. In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen. This means livestock grazing impacts on aspen seedlings will be monitored and should impacts exceed allowable levels for desired aspen regeneration, livestock will be managed to reduce their impacts.
10. The Annual Operating Instructions (AOIs) for allotments within the Glade Rangeland Management Area may be changed to reflect new information based on applicable studies and/or field observations. If changes are suggested that fall outside the parameters of the decision informed by this DEIS, they would be subject to NEPA analysis and a decision by the responsible official. The Forest Service would make the determination whether or not to undertake a new NEPA analysis at the time the recommendation is brought forward.
11. The need to properly herd livestock to achieve adequate distribution and meet allowable use criteria has long been documented. Old timers used to live with their livestock for such purposes. Over the years, better transportation methods and roads have resulted in cowboys driving back and forth to check on their cows while managing ranch operations at home. In some cases, very little cattle checking takes place. As a result, livestock learn to go where they want, when they want, and to stay as long as they want. Those places are most often grazed disproportionately and typically include riparian/wetlands and open grassland parks. This happened historically and continues to happen today. The USFS requires permittees to maintain proper distribution of livestock.
12. Several allotments on the Glade have “cow camps” which allow permittees to stay with their stock during the time they are on the Forest. In some cases these include small

wooden cabins and in others it is a camp trailer. Cow camps are allowed to reside in one place for the summer and are not required to move every 14 days like recreational campers. However, to justify these facilities, use on a regular, almost continuous basis during the summer grazing season is expected.

13. Working horses necessary to maintain summer operations are authorized to stay on the forest for a fee. While these animals are not part of the "permitted livestock", they are seen as a necessary management tool for livestock operations. Once again, to justify these animals on the forest, use on a regular, almost continuous basis during summer grazing is required.
14. It is important to know that the USFS realizes livestock use will be higher within ¼ mile of ponds. This does not mean cattle should be allowed to stomp the area within ¼ mile of a reservoir to bare ground. However, when we see utilization levels exceed allowable use standards through all parklands, within and beyond ¼ mile, then this indicates a livestock distribution issue or over-stocking. Many of the allotments across the Glade landscape have high cattle stocking levels and consequently require more intense management to avoid such resource damage.
15. The need to adjust season dates and/or livestock numbers will continue according to annual conditions and monitoring findings. It is important for permittees to remain as flexible as possible given changes in temperature and moisture and consequently forage production and use patterns. If drought conditions persist and livestock adjustments are continuous, then those adjustments may become part of the Term Grazing Permit. Consequently, if large fires, insect outbreaks, or other long-term changes in range conditions become common or widespread, then adjustments to livestock grazing may need to be part of the Term Grazing Permit.
16. On the other hand, if the end of the planned use period approaches and the permit holder believes that use will remain below allowable use criteria on key areas, he/she may request permission to remain in the pasture, or on the allotment at the end of the season, for additional time. This option only applies to those allotments/pastures where long-term trend data shows desirable conditions are being achieved or clearly moving towards desired conditions. Permission is not automatic. This option provides an opportunity for the permit holder to benefit from sound management. If over time monitoring indicates that an allotment consistently has "extra" forage remaining within allowable use criteria on key areas and desirable conditions are being achieved, the permit holder may request an increase in permitted AUM's in the form of additional time or numbers of livestock. Any permit increase is dependent on monitoring findings and analysis. AUM's authorized both annually and under term permit are an outcome of applied management and may be reduced or increased as determined by monitoring. The range of AUMs being analyzed in this document reflects use that would include a temporary 20% increase should all allotments meet the above criteria on a year when ample forage is available.
17. Once a final decision is made for this project, separate Allotment Management Plans will be written for each allotment. The Allotment Management Plan is a detailed report that

describes 1) lists of range improvements with maintenance needs identified, 2) rotation patterns and general schedules, 3) Appendix B of this DEIS for the allotment, 4) design features from this DEIS as applicable to the allotment, 5) monitoring items from this DEIS as applicable to the allotment, 6) specific information of where key monitoring sites will be located and monitored, 7) general schedule for construction of new improvements, 8) List of springs with known issues on the allotment and a general schedule for actions, 9) general schedule for inventory of springs with unknown conditions and additional details as needed.

18. As outlined in the design features section of this DEIS, ground disturbing activities such as upgrading a spring development, new pond construction, or new fence construction requires cultural resources survey and rare plant survey prior to implementation. In addition, spring work will include input from a FS hydrologist and a review of potential effects to wildlife species of concern prior to implementation. The exact location and project details for spring improvements, reservoir construction or fence construction are unknown at this time. However, if the steps above area followed, it is likely that the project can be adjusted if needed to avoid adverse impacts. If the USFS identifies the potential for significant environmental effects, a new NEPA analysis will be undertaken. This process applies to immediate proposed actions and future adaptive actions that result in ground disturbance.
19. Maintenance of structural range improvements must be performed prior to the time livestock use the improvements, or livestock are placed against the fence(s). Allotments or pastures will not be stocked until maintenance is completed. Maintenance and reconstruction of range improvements must meet USFS standards. A permit modification would be completed to outline the specifics for construction. Maintaining range improvements is a requirement of the Term Grazing Permit.
20. Proper placement and maintenance of range structural improvements such as ponds, troughs, and fences is important to public land livestock operations. For example, having fully functional water facilities that provide clean reliable water for livestock while protecting the spring source and associated wetlands is particularly important during drought conditions. Range improvements that are needed for proper livestock management MUST be maintained. Those not needed should be removed and natural healthy conditions restored. Fences and/or ponds may be in locations or constructed in a manner that causes or adds to livestock impacts and will be considered for removal as time allows. The focus for all range improvements is to improve those that currently exist, constructing new ones only when determined to be necessary through monitoring and analysis. The current cost of new range improvements and follow-up maintenance requires ample scrutiny before construction.
21. Forest Service Manual direction (2231.61 Modification of Grazing Permits) states “schedule not more than a 20 percent reduction in numbers or season in any one year to give the permittee ample time to make changes in their livestock operation.” Where permanent reductions are necessary, we would implement according to manual direction (unless reductions have already been in use for several years already).

Temporary adjustments may require more than 20 percent in a single year, depending on circumstances (i.e. fire, drought).

22. All crossing permit holders will use primary roads for crossing with over-night stays in designated locations according to their annual crossing permit.
23. Noxious and invasive weeds located within the Glade Rangeland Management Area would be treated as necessary as provided for in the design features, best management practices, and mitigation measures in Appendix A of the *San Juan National Forest Integrated Treatment of Noxious or Invasive Weeds Environmental Impact Statement* (USDA Forest Service 2005), or as updated.
24. Certified weed-free hay is required for anyone feeding stock on the Dolores Ranger District.
25. Proposed activities associated with allotment improvements would be evaluated and managed to avoid adversely effecting cultural resource. Prior to the implementation of structural improvements, the Forest Archaeologist would evaluate the improvement and develop appropriate protective measures. The Dolores Ranger District will continue to consult with the Colorado State Historic Preservation Office (SHPO) and appropriate tribes to ensure that activities will have a minimal effect on heritage resources.

Adaptive Management

Adaptive management is an interdisciplinary planning and implementation process that provides for: 1) identification of site specific desired conditions; 2) definition of appropriate decision criteria (constraints) to guide management; 3) identification of pre-determined optional courses of action, as part of a proposed action, from which to adjust management decision over time; and 4) establishment of carefully focused project monitoring to be used to make adaptive adjustments in management over time.

Administration of allotments would follow outlined objectives, trigger points/conditions, and adaptive management options to move the landscape towards desired conditions. See Appendix B for relationship between triggers and adaptive management actions specific to each allotment. The following actions would be implemented for all allotments should monitoring show that proposed actions are not moving the Glade landscape towards desired conditions within defined timeframes.

- Within specific *pastures*, reduce number of days initially by 10%. In subsequent years, if allowable use levels cannot be met, continue to reduce days until specified levels are reached
- Rest pastures for an entire grazing season one out of every 3 years
- If areas currently not showing problems in the mountain grasslands begin to show problems, to increase ground cover for wildlife and watershed purposes, utilization criteria may be changed so that spring use does not exceed 40% and fall use does not exceed 30% or 4 inches stubble height, whichever occurs first. 40% utilization maintains the vigor and viability of plants. The 30% fall use was proposed to provide additional

litter and residual plant cover for small wildlife species and watershed protection. Litter is an important component of reaching desired conditions in the mountain grasslands. We have also provided a stubble height restriction which can meet the same objective.

- Reduce numbers and/or season in the *allotment* by 10%. In subsequent years, if allowable use levels cannot be met, continue to reduce days until specified levels are reached.
- Combine small pastures
- Implement additional use mapping and adjust time according to results
- Implement stricter stubble height criteria
- Adjust on-dates
- Further reductions in percent allowable use

Monitoring and Evaluation

Many different types of methods are used to monitor resource conditions across a landscape. The methods chosen often depend on the best science available at the time as well as monitoring objectives, vegetation type and condition, and manager preference. In general, monitoring methods follow protocols found in the Rangeland Analysis and Management Training Guidelines (RAMTG, R2 USFS 1988). Monitoring techniques may not be the same for all allotments.

The following describes the short-term and long-term monitoring methods used to assess implementation effectiveness and progress toward meeting desired conditions respectively. When practical, monitoring is done with participation of both permittees and Forest Service personnel, with data shared between the two parties. In addition to long-term trend transects (Appendix F), short-term monitoring is required in order to assess whether, in the interim, indicators such as allowable forage utilization in key areas, forage production, and litter accumulation are acceptable on a yearly basis on the allotment as well as to evaluate the effectiveness of permit holder in implementing the actions specified in the Annual Operating Instructions. Much of the following descriptive information was derived from the Rangeland Analysis and Management Training Guidelines (RAMTG, R2 USFS 1988).

Three primary types of monitoring occur on grazing allotment at the District level to answer a variety of questions. As an example, if our objective is to implement a 45% allowable use criteria to promote the return of native bunchgrasses by 2025, then we would conduct the following types of monitoring:

- *Implementation Monitoring* asks the question, did we do what we said we would do? For example, did we implement a 45% utilization criteria?
- *Effectiveness Monitoring* asks the question, did the management practice we prescribed and implemented do what we wanted it to? For example, did the 45% utilization criteria promote the return of native bunchgrasses by 2025?

- *Validation Monitoring* asks the question, is there a better way to meet our goals and objectives? For example, would changing our utilization guideline help us to meet our goal? This type of monitoring is most often associated with the Forest Plan.

Short-Term or Implementation Monitoring

Implementation monitoring or short-term monitoring is used to determine whether design criteria and management practices are implemented as prescribed. They include the following specific monitoring methods and observations:

Seasonal or Drought Monitoring: On years where drought conditions persist, there are generally eight criteria applied on an allotment-by-allotment basis to help determine how well the allotment was managed. The criteria are:

- ✓ Was there significant forage production and seed head production in the pasture this season?
- ✓ Was the pasture utilized too heavily this season?
- ✓ Was there substantial re-growth of grasses and forbs after livestock were removed?
- ✓ Are there other unsatisfactory range conditions within the pasture?
- ✓ Is the allotment overstocked based on our most recent range analysis?
- ✓ Were any pastures grazed for more than 30 consecutive days?
- ✓ Does the grazing system used provide for rest or deferment of different pastures each year?
- ✓ Was there a reduction in numbers or season of use?

Drought effects will show up in the short-term as reduced plant vigor and production, especially affecting shallow rooted species. In response to stress, plants will frequently attempt to reproduce so there may be an increase in seed production in spite of a corresponding decrease in vigor and production. In the longer term, effects will be portrayed as loss of individual plants, increased open spaces, and change sin composition.

In terms of drought recovery, we would expect to see increases in young-aged plants- especially of preferred native species, decreases in interspaces between plants, increased vigor and production, and so forth. Drought 'recovery' can generally be assumed to have occurred when we have a return to approximate pre-drought composition, cover, vigor, and general rangeland health characteristics.

Range Readiness Inspections: Range is generally ready for grazing when soil has become firm and when plants have reached a defined stage of growth. At this time grazing may begin under the specific management plan without long-lasting damage. Early native perennial grasses would normally be at the four-leaf stage. Bluegrasses would be in the boot stage (seed head surrounded by leaf), forbs would be in full bloom and brush would be leafed out. If the objective is to convert meadows with undesirable plant species into desirable species, the on date for the allotment needs to coincide with range readiness for desirable species. If we can find patches of desirable species, we need to monitor for range readiness on those species at

those locations. Note that range readiness is not an absolute. Under specific circumstances, livestock may be allowed on the range earlier than range readiness. An example may be to graze a very early growing plant to reduce its competitive advantage over later growing native species.

According to the USFS Range Analysis and Management Handbook (R-2 FSH 3/85, Amend 15) the following signifies range readiness for species that may occur on this allotment:

Species	Stage of Development Indicating Range Readiness
Western wheatgrass	6" – 8" or more in height
Arizona fescue	8" or more in height, heading out
Kentucky bluegrass	Panicle fully opened
Needlegrass	6" or more in height, headed out to blooming

Allotment Inspections: Allotment Inspections are used to determine compliance with the grazing permit, AMP, and AOI which includes pasture rotations, numbers to be grazed, pasture entrance and exit dates, cleaning pastures of cattle after grazing, guidelines for allowable use, improvement maintenance and construction, and more. It is the permittee's responsibility to manage his/her operation according to the permit, which incorporates as part of it, the AMP and AOI. Results from inspections may trigger more in depth monitoring. For example, should riparian areas appear to be moving away from desired conditions, a full Properly Functioning Condition (PFC) analysis may be warranted.

Monitoring of Allowable Forage Use: Monitoring of allowable use is the joint responsibility of the Forest Service and the permittee(s). Although the Forest Service will make every effort to assist the permittee in ensuring compliance with the design criteria, since the permittee is responsible for meeting the terms and conditions of their Term Grazing Permit, the permittee has the responsibility for ensuring that allowable use criteria are not exceeded.

These criteria are designed to ensure that short-term effects of grazing are able to provide for the long-term health and sustainability of the resource. Methods for determining utilization in uplands include clipping and weighing of ungrazed and grazed areas (monitoring cages), utilization gauge, ocular estimates and others. Methods in riparian areas include in-season and/or residual stubble height and riparian shrub utilization usually immediately after grazing.

Forage use is measured or estimated on key areas. A key area is a relatively small portion of a range selected because it provides a respresentative sample of range condition, trend, or degree of use seasonally or is an important or sensitive area. Individual key areas could change as grazing management over time is adjusted based on monitoring results.

Unless otherwise stated to be more restrictive, Forest Plan guidelines for allowable forage utilization for deferred and rest rotation grazing systems is 50% and for rotation grazing systems is 45% (Forest Plan Table 2.7.1, Pg. 71). Most allotments within the Glade landscape operate under a form of a rotation grazing system. The percent use criteria do not fluctuate

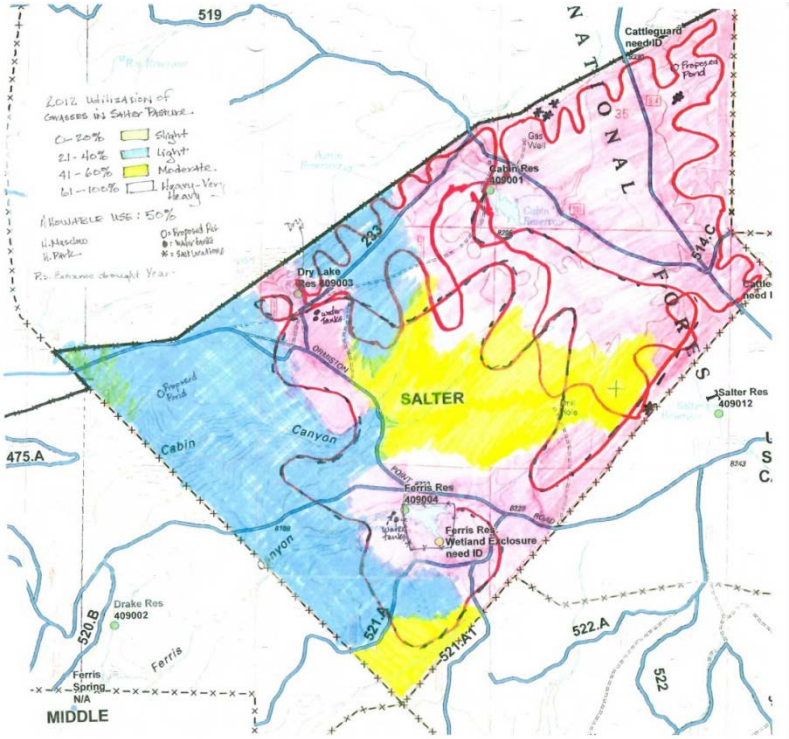
based on annual forage production. For example, on years where key species grow abundantly, 50% utilization would remove 50% of plant weight. On years where production is low, 50% utilization allows the removal of 50% of plant weight. Consequently, years of poor forage production means less plant weight and therefore, less time grazing.

Monitoring of use would occur directly following pasture use and in some cases at the end of the grazing year (i.e. residual riparian vegetation height). This would allow for cover needs of wildlife, increased litter and protection of watersheds, greater protection of pastures used during the growing season, and the maintenance of soil to hold water through accumulated litter. There is an option to monitor at the end of the grazing season rather than right after a pasture is used. This option was considered but not carried forward because 1) given current drought conditions recovery has not been taking place after livestock have left a pasture, 2) we are seeking the added benefit of more litter and cover available should recovery take place for the benefit of wildlife, watershed, and range health, and 3) visiting pastures twice is time consuming for Forest staff and permittees. Riparian vegetation criteria should be met or bettered at the time livestock leave the pasture based on the following (Forest Plan Table 2.7.2):

Season of Use/Pasture	Residual Riparian Vegetation Height*
Early growing season (i.e. significant regrowth potential)	3 inches
Mid-season (i.e. limited regrowth potential)	4 inches
Late season (i.e. little to no regrowth potential)	4-6 inches
Late fall and winter (i.e. dormant season use)	6 inches
*Maximum riparian and wetland allowable use (residue) criteria to be applied on key sedge or rush species. For riparian areas lacking sedge and/or rush species, use existing herbaceous vegetation utilization criteria. Consider the duration livestock has access to key areas when setting allowable use criteria – the shorter the duration, the less the opportunity for repeat grazing of individual plants.	

Actual Use: The permittee will furnish actual use information by November 30th each year for the previous grazing season. Since the AOI is set up in the spring for the upcoming grazing season, we cannot know at that time the exact conditions of the range. Therefore, season dates, numbers, and pasture rotations are adjusted throughout the grazing season. Actual use reflects what actually occurred for the year.

In addition, where use criteria are repeatedly exceeded, mapping of actual use may be warranted. Allotment capacity estimates assume management (i.e. proper salting, herding, etc.) will result in livestock use of all suitable lands (although possibly at different levels of use). Some allotments require more intensive management than others to achieve this, especially if stocking levels are high. One monitoring tool we use to get a clearer picture of livestock distribution is use mapping. Generally we ride on horseback through a pasture and ocularly estimate a range of percent utilization. The range of use equates to low, moderate, and high levels of which high levels exceed criteria.



Rangeland Health: This type of assessment is actually not monitoring since it provides a snapshot of conditions at a specific location at a specific time. It is generally performed by an interdisciplinary team usually at a minimum consisting of a wildlife biologist, range conservationist, and hydrologist. An example of data collected is as follows:

Date	Pasture	Assessment
7/2007	Near Draw/Brumley Allotment	No indication of erosion; bare ground matches expected; plant function, structure, composition as expected; good plant cover, plants robust and vigorous; little cattle use evident, lots of wildlife use; same or better condition than in 1991.

Long-Term or Effectiveness Monitoring

Effectiveness monitoring involves the collection of data over long periods of time. The collection and analysis of repeated observations or measurements are taken to evaluate changes in condition and progress toward meeting desired conditions. Conditions are assessed at intervals and change is measured to determine trend. Long-term monitoring is typically performed at full plant development and prior to livestock use. Permittees are encouraged to participate in effectiveness monitoring and evaluation.

Effectiveness monitoring would take place under Alterantive C to determine if/when adaptive management options are to take place. For example, if 2 out of 3 years of use monitoring shows that allowable use levels are exceeded, or if long-term trend transects show that

movement toward desired conditions is not occurring within desired timeframes, then what is currently being implemented is not working or being effective and this triggers us to implement an adaptive management option.

In some cases, livestock exclosures have been constructed which provide a comparison between grazed and ungrazed (by livestock, or at times by both livestock and big game) conditions. Most of these have long-term trend transects both inside and outside to quantify the comparison. Exclosures can also show potential condition of the land given no livestock grazing (and big game grazing, depending on the height of the exclosure fence). Exclosures are only as good as their fence maintenance has been. A map showing the locations of each long-term transect on Glade allotments is attached as Appendix F.

Four primary types of long-term trend monitoring are described as follows:

Parker 3-Step Transects: The Parker 3-Step monitoring method was developed by Kenneth Parker in 1954. It was one of the most widely used range monitoring methods used in the US Forest Service and accounts for most of the original range monitoring data. Data was gathered, assessed, and photographs taken over time from clusters of transects to eventually form a historical document showing changes in vegetation and soil erosion rates. This method collected both quantitative and qualitative data and provided a "scoring" technique for labeling resource condition as poor, fair, and good. The Parker 3-Step method is no longer considered the most appropriate monitoring method and has since been replaced by the Rooted Nested Frequency monitoring technique. However, it still provides valuable information and can often be cross-walked to newer methods to help ensure continuity of data over time.

Rooted Nested Frequency Transects (RNF): Rooted nested frequency is currently the most reliable method for determining long-term trend by analyzing change in frequency of individual plant species over time. Data is not subject to substantial fluctuations with climate. Frequency data by species is collected in nested plots within a frame placed along transect lines. Over time, if management is having the desired effect, an increase in native plant species should be evident.

Cover-Frequency Transects (CF): The Cover-Frequency method measures changes in plant species cover, height, and frequency over time for a given plot of land. Because it is difficult to estimate cover in quadrats for larger plants, this method is primarily used for grasses, forbs, and shrubs less than 3 ft. in height. Quadrats are placed systematically along randomly located transects. Cover is assessed by visually estimating the percent of a quadrat covered by vegetation. Plant species frequency is recorded as the number of times a species rooted within the quadrat occurs within a given number of quadrats.

Repeat Photography: Photography has long been a method used for gathering descriptive site data. Most long-term monitoring methods used today incorporate taking photos to accompany field notes. Photos are often the earliest records used to describe range conditions and can easily show major changes in vegetation such as the encroachment of trees or the loss of sagebrush. The key to be able to use photos for comparison are to take the photo at the same place and the same time of year, and under the same conditions (i.e. grazed versus not grazed). The older the historic photos the better, especially if they've been taken repeatedly over time. However, it is never too late to start a photo point survey. The earliest photos on file

from Glade allotments at the Dolores Ranger District office are from 1913. The following gives an example of this type of monitoring:

17277A. Glade G. S. taken 1913.

Validation Monitoring

Validation monitoring simply identifies whether or not standards, guidelines, and objectives are still appropriate. Validation monitoring also determines whether a need to change management is desirable. Validation monitoring usually occurs after effectiveness monitoring has been accomplished and results compiled. Adaptive management measures are generally applied if validation monitoring determines changes are necessary.

Validation monitoring took place during the analysis for this DEIS. Results showed that utilization guidelines were clearly defined and repeatedly exceeded (if not currently then historically). Results also show the need for developing clear, concise and measurable objectives tied to RNF transects with specific actions and defined timelines to be taken to meet those objectives.

Other Resource Monitoring

Long-term monitoring is established for and performed by resources other than range. The results of this monitoring are often used to adjust livestock operations when livestock impacts are occurring.

Hydrologic Monitoring: Hydrologic monitoring involves both qualitative and quantitative assessments of wetland and riparian ecosystems from the stream stretch level to the watershed level. Properly Functioning Condition (PFC) is an ocular survey performed by an interdisciplinary team that ultimately determines if a stream is properly functioning (PFC), functioning at risk of deterioration (FAR), or nonfunctional (NF). Other types of hydrologic data are gathered using Element Occurrence Reporting, Water Right Field Verification, and Historic Notes. Each type gathers basically the same type of information just in different formats.

Riparian exclosures are used to evaluate herbivore impact (especially big game and/or livestock) on riparian condition and trend. These exclosures are often placed in areas where range degradation is apparent, and are designed to reveal the degree of degradation, as well as the herbivore(s) responsible for the degradation. Measuring differences in ground cover and stream bank stabilization is the primary focus on these exclosures which compare results inside and outside the exclosure.

The following is an example of data collected during hydrologic monitoring:

Location	Pasture Unit	Date	Findings
Below Log Camp; Spring/Dry Canyon headwaters	Hoppe Point/Calf Allotment	8/2013	Functioning At Risk (FAR) with probable downward trend. Area has potential to be wetter with improved spring; site once very degraded as evidenced by old gullies; causal factors past and current livestock grazing, OHV/Recreation use.

Soil and Watershed Condition Monitoring: The current and proposed cattle grazing system incorporates Best Management Practices (BMPs) and constitutes compliance with the *Watershed Conservation Practices Handbook* (FSH 2509.25) and the Colorado Department of Public Health and Environment – Water Quality Control Division website (June 2014), *Regulation No. 34-Classifications and Numeric Standards for the San Juan River and Dolores River Basins*.

Watershed condition can be assessed using information from the monitoring methods above. Monitoring of plant abundance, ground cover, species diversity, and estimates of overall soil condition (using the methods described throughout this monitoring section) would indicate whether or not management practices are effectively meeting management goals. Trends toward improvement in species abundance and diversity should indicate that management practices are effectively improving soil condition and, by inference, maintaining or improving downstream water quality and complying with water quality standards. Conversely, decreases in plant abundance and species diversity may indicate that management practices are not effective and need to be changed. Environmental factors, especially precipitation, would be considered when evaluating monitoring results. If plant cover, litter cover, and/or soil condition decline, changes would be made to livestock numbers, grazing period, grazing time, or pasture rotation.

Precipitation Monitoring: Precipitation is currently recorded at several locations by various agencies. The Colorado Climate Center monitors drought conditions. The Natural Resources Conservation Service has several *Snotel* sites that measure snow pack and water content. The closest Snotel site to the Glade is on Black Mesa, above the town of Dunton. Precipitation data may be recorded within or near allotments for more localized information. Precipitation data may be recorded throughout the year and summarized in the annual inspection. This data assists managers with forage utilization and production data collection.

Noxious Weeds Monitoring: Noxious and invasive weeds located within allotments are treated as necessary. The grazing permittee and Forest Service coordinate weed inventory and treatment activities. Design features, best management practices, and mitigation measures in

Appendix A of the M*anagement and Control of Noxious plants on the San Juan National Forest Plan* will be implemented (USDA Forest Service 1996).

Table 2.4 Summary of Monitoring Methods and Schedule

Monitoring Method	Time Frame and Interval	Primary Responsible Party
Short-term or Implementation Monitoring		
Seasonal or Drought	Every year	USFS
Range Readiness	Every spring on a representative sample basis	USFS & Permittee
Allotment Inspections	Every year during grazing season as need and time allow	USFS
Allowable Forage Use	Every year during grazing season and as appropriate at the end of the grazing season or growing season	Permittee and USFS
Actual Use	Every year during grazing season	Permittee
Rangeland Health (not monitoring)	When wanting to assess point in time	USFS
Long-term or Effectiveness Monitoring		
Parker 3-Step Transects	No longer used as a stand-alone method but may be re-read to allow conversion to other methods	N/A
Rooted Nested Frequency	Approximately every 10 years, unless specified otherwise on specific transects	USFS
Cover Frequency Transects	Approximately every 10 years, unless specified otherwise on specific transects	USFS
Repeat Photography	No specified timeline but a ten year cycle is desirable	USFS and Permittee
Validation Monitoring		
Validation Monitoring	At time of permit renewal/NEPA analysis	USFS with permittee
Other Resource Monitoring		
Hydrologic Monitoring/Properly Functioning Condition	Approximately every 10 years, unless specified otherwise or concerns	USFS

Monitoring Method	Time Frame and Interval	Primary Responsible Party
	arise	
Soil and Watershed Condition (including water quality)	Upon noticed changes unless specified	USFS monitors BMPs; Colorado State monitors water quality
Precipitation Monitoring	Annually, usually in the spring before spring permittee meetings	Natural Resources Conservation Service
Noxious Weed Monitoring	Annually	USFS and Permittee
Erosion Control Structures	5 and 10 years after construction and at points where events may have changed conditions	USFS
Seeding	5 and 10 years after treatment and at points where events may have changed conditions	USFS

2.3 Comparison of Alternatives

The following three tables summarize and compare different aspects of the alternatives being analyzed. The first table (Table 2.5) compares actions to be taken among the various alternatives. The second table (Table 2.6) compares effects of implementing the various alternatives as they respond to issues. The third table (Table 2.7) compares effects of the various alternatives as they respond to other components of the purpose and need.

Table 2.5 Actions Compared Among Alternatives

Alternative	No Grazing	Current Permitted	Proposed Action
AUMs permitted	0	19,568	Approximately 18,023 AUMs (with a maximum of 21,628 AUMs) but will vary over time depending on the condition of the allotment, available forage, effectiveness of implementation, and results of monitoring and analysis
Season of Use	N/A	5/26 – 10/31	5/10-11/10
Range Structures	Removed unless purpose other than livestock; no inventory to identify conditions; no improvements on existing structures unless for	Focus on maintaining existing structures; no inventory to identify conditions; some improvements on existing structures	Focus on maintaining existing structures; inventory to assess conditions; Improve at least 2 spring structures every years; minor

Alternative	No Grazing	Current Permitted	Proposed Action
	purposes other than livestock		additions of new fences and ponds
Administration of Allotment	N/A	As current with no new administrative actions	Define objectives, management actions, design criteria, adaptive options, and monitoring with specific trigger points and time frames
Desired Conditions	Forest Plan general statements	Forest Plan general statements	Forest Plan general statements with specifics for Glade landscape
Monitoring	Minimum for resource protection	Maintain current short-term and long-term monitoring; identify key monitoring areas	Maintain current long-term monitoring; identify key monitoring areas; increase short-term monitoring to include use-mapping in those pastures/allotments where livestock distribution is a concern
Adaptive Management	N/A	N/A	Implement well defined adaptive management actions based on design criteria and monitoring with established trigger points

Table 2.6 Summary of primary effects of implementing the various alternatives

Resource	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
Soils	Rapid recovery	Problem areas remain	Problem areas slowly recover
Watershed & Water Quality	Water quality standards met; unhealthy water sources recover more rapidly	Water quality standards met; unhealthy water sources may or may not recover	Water quality standards met; unhealthy water sources recover slowly
Vegetation	Rapid recovery of bare ground, slower recovery of plant species diversity and return of native bunchgrasses; Possible loss of plant vigor in long term	Some places would have slow recovery of bare ground and plant species diversity with return of native bunchgrasses; other areas would continue to decline.	Slow recovery of bare ground with slower recovery of plant species diversity and return of native bunchgrasses
Invasive Plants	The greatest amount of ground cover results in the slowest spread of weeds; continued weed treatment required	The least amount of ground cover results in the fastest spread of weeds; continued weed treatment required	Improved groundcover results in slower spread of weeds; continued weed treatment required

Resource	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
TES Plants	No impact from permitted livestock	Potential impacts from grazing and trampling	Potential impacts from grazing and trampling
Wildlife & Fish	Improved wildlife habitat in the short-term, with possible decadence given the lack of grazing over the long-term	Some wildlife habitat would continue to have slow recovery while other areas would continue to decline	Recovery of wildlife habitat would occur with some areas improving slowly and others more rapidly
Socio-Economics	Most economic impact to livestock permittees and local communities	Least economic impact to livestock permittees and local communities	Some impacts to a few permittees possible; level of impact depends on outside forces and permittee ability to adapt
Heritage	No impact to cultural resources	Continued impacts as historically occurred	Continued impacts as historically occurred
Range	0 AUMs permitted; no grazing season; removal of range facilities, consumptive use of 0 acre feet of water	Maximum 19,568 AUMs permitted; grazing season 5/26-10/31; continued maintenance of range facilities with minor new construction, consumptive use of 24.6 acre feet of water	Average AUMs permitted is 18,023 with a maximum potential of 21,628 AUMs; maximum range for grazing season 5/10-11/10; continued maintenance of range facilities with minor new construction, consumptive use of 22.6 acre feet of water
Recreation & Transportation	No recreation/cattle encounters; No need for cattleguards, fences or gates; rapid improvement of water sources and associated wildlife viewing	Continued encounters between recreation/cattle; continued need for cattleguards, fences and gates; water sources remain degraded reducing wildlife viewing opportunities	Continued encounters between recreation/cattle; continued need for cattleguards, fences and gates; slow improvement of water sources and associated wildlife viewing

Table 2.7 Effects of the various alternatives as they respond to other components of the purpose and need

Component	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
Resiliency to Climate Change	Range health at specific locations would improve in the short term and would be resilient to climate stressors sooner than other alternatives. With much less grazing pressure, vegetation may become decadent and	Range health at specific locations would not improve over current conditions and would not be resilient to climate stresses, running the risk of losing ecological function particularly if severe weather events persist.	Range health at specific locations would become more resilient to climate stressors and ecological function would be improved. USFS likely to detect and react more quickly to climate stresses

Component	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
	bare ground may increase reducing resiliency in the long term. Less reliable clean water would be available for wildlife or riparian species with fewer water developments maintained		in all vegetation types because of refined desired condition statements with specific objectives
Provide for Ranching Operations on National Forest System lands	Does not provide ranching opportunities	Continues to provide ranching opportunities	Continues to provide ranching opportunities

Chapter 3: Affected Environment and Environmental Consequences

This chapter summarizes the physical, biological, social, and economic environments of the project area and the potential effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives linked to references and specialist reports. This analysis describes how each different alternative may potentially affect (impact) baseline conditions of individual resources within the planning area. If a particular use or management action is not discussed for a particular resource, it is because negligible impacts are expected.

The following analysis of environmental consequences is organized by resource area and discloses the direct, indirect, and cumulative effects of the Proposed Action and alternatives on those resources. Only those resources determined to be potentially impacted are analyzed. Note: Acreages may vary within this assessment due to the variability associated with GPS and GIS.

The following terms may be used in this chapter when describing impacts:

Direct/Indirect Impacts: In general, direct impacts result from activities and occur at the same time and place as the management activity or action causing the impact. Indirect impacts could occur days after the activity has taken place or may occur some distance from the initial disturbance.

Short- or Long-Term Impacts: For the purposes of this DEIS, short-term impacts occur during or immediately after the activity or action and may continue to occur for up to two years following. Long-term impacts continue to occur beyond two years.

Cumulative Impacts: Cumulative impacts result from the addition of past, present, and reasonably foreseeable future actions in combination with the current action. To analyze cumulative effects, activities and events that overlap in time and/or space with the Proposed Action and project area are considered. This area is referred to as the *cumulative effects area* in this DEIS. The cumulative effects area may vary by resource and is defined under each resource area analyzed in this chapter.

Climate

There are two ways to look at climate change effects for a site-specific project: (1) the effect of a proposed project on climate change (i.e., greenhouse gas emissions and carbon cycling), or (2) the effect of climate change on the proposed project (such as expected shifts in rainfall or temperature). This project is not expected to make any substantial contribution to the emission of greenhouse gases or to carbon cycling. Only a minor amount of carbon would be generated through the use of vehicles associated with livestock operations. Improving range condition through improved livestock management in addition to other vegetation treatments such as fuels reductions can improve carbon cycling, but this too would be difficult to measure.

On the other hand, changes in climate can affect every resource analyzed in this document. The following discussion on climate and what we may or may not expect in the near future is used to establish the premise for impacts in this analysis.

The weather station nearest the Glade landscape with the most complete data is located at Cortez, CO. Between 1940 and 2013, average annual precipitation at Cortez was 12.67 inches. The maximum annual precipitation occurred in 1957 measuring 26.34 inches. The minimum annual precipitation occurred in 1989 measuring 5.23 inches. Mimicking a pattern reflected across the contiguous 48 states (EPA, 2012), ten of the fourteen years between 1999 and 2013 had less than average rainfall. Two nearby stations, Dolores and Yellow Jacket, show slightly higher rainfall amounts due to increases in elevation but very similar weather patterns. Dolores' mean annual precipitation measures 18.86 inches, with a maximum of 31.97 inches occurring in 1957 and a minimum of 11.58 inches occurring in 1989. Yellow Jacket has a short period of record from 1963 to 2002. During this time, Yellow Jacket's mean annual precipitation was15.52 inches with a maximum precipitation of 23.68 inches in 1965 and a minimum precipitation of 7.6 inches in 1989. The Glade landscape is higher in elevation than Cortez, Dolores, and Yellow Jacket so average annual rainfall would have been slightly higher between 1940 and 2013 but weather patterns would have been similar.

Average annual temperature between 1940 and 2013 in Cortez was 49.3°F. The maximum annual temperature was 52.8°F while the minimum annual temperature was 47.4°F, showing relatively little fluctuation in temperatures from year to year. Temperature data for Yellow Jacket shows a similar pattern. Temperature data for Dolores was insufficient to generate comparable averages. Temperatures on the Glade would have been slightly cooler with similar minimal fluctuations in annual averages from year to year.

Weather patterns and conditions that result in low precipitation, high evapotranspiration, and decreased runoff are categorized as drought conditions. A common measure of drought conditions is the Palmer Drought Severity Index (PDSI). According to historic PDSI records which began in 1895, the 1930s and the 1950s saw the most severe and widespread droughts across the nation while the last 50 years have generally been wetter than average (EPA, 2012) even when factoring in recent drought conditions. Furthermore, in comparing the 20th century to the previous centuries (1550-1850), the 20th century can be characterized in general as having warmer and wetter conditions (Romme, Floyd, and Hanna, 2009). For example, the period from 1976-1995 was one of the wettest in the southwestern United States in the last thousand years (Romme, Floyd, & Hanna, 2009). Looking ahead however, geospatial climate forecast data predicts that the 21st century is expected to have warmer than average temperatures and variable precipitation across the United States (TACCIMO, 2013). Geospatial climate forecast models run specifically for Dolores County, CO predict an average temperature increase between 2.3°C and 3°C and an average decrease in precipitation between 4.1 mm (.16 inches) and 4.8 MM (.18 inches) (TACCIMO, 2013). In addition, current trends for southwestern Colorado point to less precipitation in the form of snow, overall reductions in snowpack, and earlier spring snowmelt (EPA, 2012). Thus, while the last century and the last 50 years on average were warmer and wetter than previous centuries, the future is predicted to be warmer and drier thereby increasing the likelihood of more persistent drought conditions (Appendix G).

There have been a lot of fluctuations since the 1940s in terms of moisture, but not in terms of temperature. Management should prepare for low precipitation and while at the same time be prepared for periodic heavy rains/snows that could result in flooding. In other words, management should plan on consistent and returning drought. Managing the landscape's ability to be resilient to change, including climate change, is a major focus in this DEIS.

3.1 Soil Resources

3.1.1 Affected Environment

The Glade landscape occurs within the physiographic province of the Colorado Plateau. The Colorado Plateau largely consists of thick horizontal beds of limestone, sandstone, siltstone, and shale that were laid down in shallow marine waters. The climate of the plateau is generally arid which facilitates the process of erosion; thus, the plateau is also made up of distinctive erosional features such as mesas, cuestas, rock terraces, retreating escarpments, canyons, and dry washes. The Glade landscape contains a number of these characteristic features.

The principal feature of the Glade landscape is a large mesa top. The mesa top consists predominantly of the Dakota and Burro Canyon formation to the south and the Dakota sandstone to the north. The Dakota and Burro Canyon formation is comprised of quartzitic sandstone and conglomerate sandstone with minor amounts of claystone, siltstone, shale, and mudstone and is light grey and light brown. The Dakota sandstone has a similar composition but is yellowish-brown to grey. The canyons to the west of the mesa cut predominantly through the Morrison formation on their way to the Dolores River valley. The Morrison formation is a distinctive sequence of sedimentary rock that is composed of mudstone, sandstone, siltstone and limestone and is light grey, greenish gray, or red. In the Dolores River valley the Dolores River traverses Quaternary alluvium that consists of silt, sand, and gravel. To the east and northeast of the Glade landscape the surface geology consists predominantly of Mancos shale. Mancos shale is cretaceous marine clay shale with thin platy beds of limestone and calcareous sandstone and is grey to dark grey.

The three predominant soil map units occurring on suitable grazing acres (Table 3.1) are the Jemco-Detra-Beje complex, the Granath-Fughes complex, and the Dolores-Fivepine complex. The Jemco-Detra-Beje map unit is a complex of shallow to deep, well drained soils on mesas, hills, and ridges. The unit consists of 40 percent Jemco silt loam, 30 percent Detra loam, 20 percent Beje loam, and 10 percent included soils. Slopes range from 1 to 15 percent. It is predominantly derived from sandstone. Infiltration rates are moderate to very slow, surface runoff is medium to high, and hazard of erosion by water is moderate.

The Granath-Fughes map unit is a complex of very shallow to very deep, well drained soils on hills and mesas. The unit consists of 50 percent Granath loam, 35 percent Fughes loam, and 15 percent included soils. Slopes range from 0 to 15 percent. Parent material for the Granath loam is eolian deposits derived from sandstone. Parent material for the Fughes loam is alluvium and/or slope alluvium derived from sandstone and shale. Infiltration rates are moderate to slow, surface runoff is medium to high, and hazard of erosion by water is moderate.

The Dolores-Fivepine map unit is a complex of shallow to very deep, well drained soils on hills and mesas. The unit consists of 50 percent Dolores loam, 35 percent Fivepine flaggy loam, and 15 percent included soils. Slopes range from 0 to 15 percent. Dolores parent material is slope alluvium derived from sandstone and Fivepine parent material is residuum and slope alluvium derived from sandstone. Soil infiltration rates are slow to very slow, surface runoff is very high, and hazard of erosion by water is low to moderate.

None of the three predominant soil map units contain soils that are prime farmland. None of the three predominant soil map units contain soils that are high in salinity. However, moderately saline soil does occur in the northeast portion of the Glade landscape within the Lillings silty clay loam soil map unit. The Lillings silty clay loam is a very deep, well-drained soil occurring along drainage ways and floodplains. The Lillings silty clay loam is prime farmland, if irrigated. Two other soil complexes within the Glade landscape have the potential to be prime farmland: the Wetherill loam, if irrigated and the Umbar-Winner-Tesajo complex, if irrigated and drained. Soils with the potential to be prime farmland comprise less than 1 percent of the Glade landscape.

Table 3.1 Primary soil units

Soil Classifications for the Glade landscape Soil Classification	Acres occurring on suitable rangeland
Jemco-Detra-Beje complex, 1 to 15 percent slopes	19,017
Granath-Fughes complex, 0 to 15 percent slopes	13,304
Dolores-Fivepine complex, 0 to 15 percent slopes	10,896

3.1.2 Desired Conditions

Desired conditions are derived from the Watershed Conservation Practices Handbook for Region 2 (WCP) and the LRMP and are incorporated into the alternatives as desired conditions or design criteria as appropriate with site-specific modifications. The following management measure is outlined in the WCP:

Maintain or improve long-term levels of organic matter and nutrients on all lands (14.2 Management Measure 14).

The following desired conditions (DC) are outlined in the LRMP:

- Soil productivity is intact on all riparian area and wetland ecosystems on the SJNF. (DC 2.4.9)
- Long-term levels of soil organic matter and soil nutrients are maintained at acceptable levels on all riparian area and wetland ecosystems of the SJNF. (DC 2.4.10)
- Ground cover (vegetation and litter) is adequate to protect soils and prevent erosion on all riparian area and wetland ecosystems of the SJNF. (DC 2.4.11)

- Long-term impacts to soils (e.g., soil erosion, soil compaction, soil displacement, puddling, and/or severely burned soils) from management actions are rare on all riparian area and wetland ecosystems of the SJNF. (DC 2.4.12)
- Rangelands provide diverse, healthy, sustainable plant communities and conserve soil quality (DC 2.7.5)

3.1.3 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted livestock Grazing

Under the no action alternative, soils in unsatisfactory condition due to effects from livestock grazing would remain in that state for some time, particularly the high-use areas near fence lines, corrals, salt sites, stock ponds, and troughs. However, all soils would eventually move towards a satisfactory condition with abundant plant growth, species diversity, and a subsequent build-up of stabilizing ground cover to the extent that livestock grazing is a causative factor. Organic matter and nutrients would increase and soil productivity would improve. Soil erosion, compaction, and displacement would be reduced. Upland areas would begin to function properly with gullies stabilizing and water flow patterns and pedestals being reduced.

Soils in satisfactory condition would remain in that state.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

Under the current grazing alternative, some of the soils in unsatisfactory condition due to effects from livestock grazing may recover with current grazing, but at a much slower rate than the no grazing alternative, and it is not clear how long it would take to get to satisfactory conditions. For those soils that do move towards satisfactory conditions there would be abundant plant growth, an increase in species diversity, and a subsequent build-up of stabilizing ground cover. Organic matter and nutrients would increase and soil productivity would improve. Soil erosion, compaction, and displacement would be reduced. Upland areas would begin to function properly with gullies stabilizing and water flow patterns and pedestals being reduced.

Some of the soils in unsatisfactory condition would not recover. These soils may not experience abundant plant growth or an increase in species diversity under current grazing and therefore stabilizing ground cover would not increase over time. Soil erosion, compaction, and displacement may continue at current rates. Gullies may not stabilize and water flow patterns and pedestals would remain unchanged on the landscape.

Soils around high-use areas near fence lines, corrals, salt sites, stock ponds, and troughs would remain in unsatisfactory condition.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Under the Proposed Action Alternative, soils in unsatisfactory condition due to the effects of livestock grazing would recover as the IDT identifies these areas and applies management options that allow for more rapid adjustment of grazing if initial corrective measures did not improve conditions as expected. Unsatisfactory soil conditions would move towards

satisfactory conditions at a slower rate than under the no grazing alternative but at a faster rate than the current grazing alternative. Plant succession from early to mid to late successional species, increased plant diversity, and plant re-growth would occur under this alternative. Ground cover, organic matter, and nutrients would increase and soil productivity would improve. Soil erosion, compaction, and displacement would be reduced. Upland areas would begin to function properly with gullies stabilizing and water flow patterns and pedestals being reduced.

Soils around high-use areas near fence lines, corrals, salt sites, stock ponds, and troughs would remain in unsatisfactory condition.

3.2 Watershed, Water Quality, Riparian-Wetland

3.2.1 Affected Environment

Watersheds

The Glade landscape is contained within the larger 4th level watershed called the Upper Dolores River. Within the Upper Dolores River watershed and intersecting the Glade landscape are the Plateau Creek, Disappointment Creek, McPhee Reservoir-Dolores River, and Ponderosa Gorge-Dolores River 5th level watersheds. Major drainages in the Glade landscape include Plateau Creek, Beaver Creek, Dry Canyon, Ryman Creek, Hunt Creek, Glade Canyon, Narraguinnep Canyon, Salter Canyon, and a portion of the Dolores River (see Appendix G).

Watersheds that have more than 50% Mancos shale soil were identified in the LRMP as having a high potential for salinity issues. Within the Glade landscape those 6th level watersheds are: Upper Disappointment Valley, Summer Camp Creek-Plateau Creek, Calf Creek, Headwaters Plateau Creek, Ryman Creek, Hunt Creek-Disappointment Creek, and Sheep Camp Valley-Disappointment Creek (Appendix G). Ryman Creek consists of approximately 82% Mancos shale soils and the Headwaters Plateau Creek consists of 72% Mancos shale soils.

Gully plugs and contour furrows were installed in various locations within the Ryman Unit of the Brumley Allotment within the Ryman Creek watershed for the purpose of reducing soil erosion, reducing overland flow rates, and increasing water infiltration into the ground with secondary effects of salinity reduction. The plugs and furrows worked temporarily to reduce localized erosion but widespread erosion throughout the watershed continues. In addition to high potential for salinity issues, watersheds sensitive to human disturbance were also identified in the LRMP. Within the Glade landscape the Brumley Valley-Disappointment Creek watershed is identified in the LRMP as a watershed sensitive to anthropogenic disturbance.

Upland hydrology was assessed in the Mair, Brumley, and Glade allotments using the following rangeland health indicators (USDI, 2005): gullies, water flow patterns, pedestals, compaction layer, and bare ground. In general, within the Mair Allotment all hydrologic indicators show a none to slight departure from reference conditions across the landscape. Exceptions occur at reservoirs where the bare ground and compaction layer show a slight to moderate or moderate to extreme departure from reference conditions. Within the Brumley Allotment bare ground is the most widespread issue with 10 out of 13 assessment locations having slight to moderate or moderate to extreme departures from reference conditions. Water flow patterns, pedestals,

and compaction layer are less widespread but are slight to moderate or moderate to extremely departed from reference conditions in about half of the areas assessed. The hydrologic indicator with the least occurrence across the Brumley Allotment is gullies. Gullies are a common feature in the Ryman pasture but relatively rare elsewhere in the allotment. Hydrologic indicators in the Glade allotment rated no more than a slight to moderate departure from reference conditions for all sites. Again, bare ground is the indicator most commonly departed from reference conditions. Least departed are gullies and compaction layer.

For the remainder of the allotments, general observations indicate gullies are relatively rare with bare ground being the most common issue across the landscape. Compaction layer is present around reservoirs but not common throughout the allotments. Water flow patterns and pedestals are present on portions of the landscape but at no more than a slight to moderate departure from reference conditions except on lower elevation pinon-juniper sites.

Water Quality

A portion of the Glade landscape is located within water quality control stream segments 4a, 4b, 11, and 15 of the Dolores River Basin (CDPHE-WQCD, September 2013, Regulation No. 34). These segments include the mainstem of the Dolores River from a point immediately below the confluence of the West Dolores River to the bridge at Bradfield Ranch; the tributaries to this segment of the Dolores River from their source to their confluence; and all wetlands, lakes and reservoirs, including McPhee Reservoir (Appendix G). Beneficial use classifications include Aquatic Life Cold 1 and 2, Recreation E, Water Supply, and Agriculture.

The remainder of the Glade landscape is located within water quality control stream segments 1a, 1b, 3a, 3b, and 7 of the Lower Dolores River Basin (CDPHE-WQCD, September 2013, Regulation No. 35). These segments include the main stem of the Dolores River from the bridge at Bradfield Ranch to a point immediately above the Highway 141 road crossing near Slick Rock, CO; the tributaries to this segment of the Dolores River from their source to their confluence; and all wetlands, lakes and reservoirs, including Cabin Reservoir, Beef Trial Reservoir, Dry Lake, Glade Lake, and Glade Point Reservoir. Beneficial use classifications include Aquatic Life Cold 1, Aquatic Life Warm 2, Recreation E, Water Supply, and Agriculture. Surface waters in segment 3a are use-protected. A use-protected designation allows for some water quality degradation as long as parameters associated with use classifications continue to meet State water quality standards.

A designation of Water Supply indicates that surface waters are suitable or intended to become suitable for potable water supplies; it does not necessarily indicate that they are currently used for water supplies. However, several municipalities are served by surface waters originating on or traversing the Glade landscape. Those municipalities are Dolores, Cortez, Towoac, and Dove Creek. Only the waters draining to the north of the project area do not supply municipal water.

Finally, the Dolores River was designated through the LRMP as suitable for inclusion in the Wild & Scenic Rivers Act from the dam at McPhee Reservoir to Bedrock, CO based on the presence of several Outstandingly Remarkable Values. The State of Colorado recognizes river segments with wild and scenic characteristics with a High Quality Water designation. Subsequently,

segments4a, 4b, and 11 of the Dolores River Basin and segments 1a, 1b, and 7 of the Lower Dolores River Basin have High Quality Water designations.

Stream segments that are not fully supporting their designated beneficial uses by exceeding one or more numeric or narrative standards are defined as impaired and placed on the State's 303(d) List. McPhee Reservoir is listed as impaired for mercury in fish tissue. In addition to the List of Impaired Waters, there is a Monitoring and Evaluation (M&E) List, which identifies water bodies that are suspect of water quality problems, but uncertainty exists regarding several factors, such as reliability of the data. Disappointment Creek, a creek that receives stream flow from several drainages within the Glade landscape before entering the Dolores River, is listed on the M&E for selenium and E. Coli. And though not listed on the M& E, salinity levels are known to be high in Disappointment Creek and its tributaries.

Riparian-Wetland

Wetlands are areas that are saturated by surface or ground water. Vegetation that grows in wetlands is typically adapted for life in saturated soil conditions. Riparian areas, such as a stream bank, are a transition area between permanently saturated wetlands and upland areas. These areas can be detected on the landscape by their physical features and sometimes by their characteristic vegetation. Lands along perennially and intermittently flowing rivers and streams and the shores of lakes and reservoirs with stable water levels are typical riparian areas.

Riparian plant density and plant community development can vary based on saturation level of the soil. Natural and human-caused disturbance can also affect the plant community. A range of stages, from the absence of stabilizing plants to the presence of these plants to the development of riparian plant community complexes (ecological potential) are possible depending upon conditions. Obligate wetland plants are found in saturated soil conditions. Facultative wetland plants are found growing in areas where the soil is saturated more than half of the time. Upland species are generally found where soils tend not to be saturated. Table 2 of Appendix G describes wetland-riparian plants under different conditions.

3.2.2 Desired Conditions

Desired conditions are derived from the Watershed Conservation Practices Handbook for Region 2 (WCP) and the LRMP. The following management measure is outlined in the WCP:

- Maintain or improve long-term levels of organic matter and nutrients on all lands (14.2 Management Measure 14).

The following desired conditions (DC) are outlined in the LRMP:

- Upland areas function properly and do not contribute to stream-channel degradation (DC 2.6.12).

3.5.3 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

Under the no action alternative, water quality standards would continue to be met and state-classified water uses would continue to be supported for all water bodies, with the exception of McPhee Reservoir and its Aquatic Life standards for mercury. The water quality of municipal water supply water would be protected and enhanced and would meet applicable drinking water standards when given appropriate treatment. As conditions improve under a no grazing scenario, watersheds containing saline soils would exhibit stable upland, riparian, and channel conditions that produce water as close as possible to reference conditions and saline watersheds would produce the lowest possible saline contributions to the upper Colorado River. The timeframe for this improvement is many many years with some areas not improving even within that time frame.

Under the no grazing alternative, riparian-wetland areas would be maintained at or move towards proper functioning condition and riparian-wetland ecosystem conditions would improve relative to impacts from livestock. With the exception of Hunt Creek, Ryman Creek, and the Dolores River, stream health conditions would be maintained at or move towards robust stream health with the extent of stable banks approaching reference conditions. The no grazing alternative would move specific riparian habitats previously described towards desired conditions (see Tables 5 through 11 Appendix G). Improvements to riparian-wetland function, ecosystem condition, and stream health would occur gradually for intermittent and ephemeral systems (on the order of decades) and more quickly for perennial systems (on the order of years).

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

Under the current grazing alternative, water quality standards would continue to be met and state-classified water uses would continue to be supported for all water bodies. The water quality of municipal water supply water would be protected and would meet applicable drinking water standards when given appropriate treatment.

Under current grazing, watersheds containing saline soils may not experience abundant plant growth or an increase in species diversity and therefore stabilizing ground cover would not increase over time. Soil erosion, compaction, and displacement may continue at current rates in these watersheds. In which case, gullies may not stabilize and water flow patterns and pedestals would remain unchanged on the landscape. These watersheds would not exhibit stable upland, riparian, and channel conditions that produce water as close as possible to reference conditions and saline watersheds would not produce the lowest possible saline contributions to the upper Colorado River.

Watersheds not containing saline soils are likely to improve under current grazing, but at a much slower rate than the no grazing alternative, and it is not clear how long it would take to get to satisfactory conditions. These watersheds are more likely to exhibit stable upland, riparian, and channel conditions that produce water with acceptable levels of water quality.

Under the current grazing alternative, most of the riparian-wetland areas would continue to function as currently rated under Proper Functioning Condition protocol, maintaining their

current trends. Riparian-wetland ecosystem conditions that are improving under current management would continue to improve. Riparian-wetland ecosystem conditions that are deteriorating under current management would continue to deteriorate and to potentially move down a condition class (e.g., a riparian-wetland areas that is Functional-At Risk with a downward trend has the potential to become Nonfunctional). Stream health conditions would remain unchanged from current conditions for most of the streams in the analysis area, with the possibility of some streams that were rated "At-risk" becoming "Diminished." The effects to specific riparian habitats when moving away from desired conditions are described in Tables 5 through 11 Appendix G. Improvements to riparian-wetland function, ecosystem condition, and stream health, where they are currently occurring, would take longer than under the no grazing alternative.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Under the Proposed Action Alternative, soils, upland conditions (hydrologic function), and riparian areas in unsatisfactory condition due to the effects of livestock grazing would recover as the interdisciplinary team identifies these areas and applies management options that allow for more rapid adjustment of grazing if initial corrective measures did not improve conditions as expected. Unsatisfactory conditions would move towards satisfactory conditions at a slower rate than under the no grazing alternative but at a faster rate than the current grazing alternative.

Water quality standards would continue to be met and state-classified water uses would continue to be supported for all water bodies, with the exception of McPhee Reservoir and its Aquatic Life standards for mercury. The water quality of municipal water supply water would be protected and enhanced and would meet applicable drinking water standards when given appropriate treatment. As conditions improve under the Proposed Action Alternative, watersheds containing saline soils would exhibit stable upland, riparian, and channel conditions that produce water as close as possible to reference conditions and saline watersheds would produce the lowest possible saline contributions to the upper Colorado River.

Under the Proposed Action Alternative, riparian-wetland areas would improve as the IDT identifies these areas and applies management options that allow for more rapid adjustment of grazing plans if initial corrective measures did not improve conditions as expected. Riparian-wetland areas would be maintained at or move towards proper functioning condition and riparian-wetland ecosystem conditions would improve. With the exception of Hunt Creek, Ryman Creek, and the Dolores River, stream health conditions would be maintained at or move towards robust stream health with the extent of stable banks approaching reference conditions. The Proposed Action Alternative would move specific riparian habitats towards desired conditions (see Tables 5 through 11 Appendix G). Improvements to riparian-wetland function, ecosystem condition, and stream health would occur at a slower rate (except where ponds are fenced as an adaptive management option) than under the no grazing alternative but at a faster rate than the current grazing alternative; however, recovery for intermittent and ephemeral systems would still be on the order of decades and recovery for perennial systems would still be on the order of years.

3.3 Vegetation

3.3.1 Affected Environment

Since this analysis is directly related to livestock grazing, this section focuses on forage resources within each vegetation type. For example, although ponderosa pine is the dominant plant species in the Ponderosa Pine type, the shrub and herbaceous (grass and forb) layers in the stands contain the forage resources. So, when the vegetation type is described, it is the forage resources and not the forest structure of tree-dominated vegetation types that is the focus.

The six major upland vegetation types and nine subtypes identified within the landscape are as follows (for extensive descriptions of each, see Appendix D):

- Ponderosa Pine/Gambel's Oak
    - Subtype #1: Ponderosa Pine/Shortgrass/Shallow Soils/More Dry
    - Subtype #2: Ponderosa Pine/Midgrass/Shallow to Mid-Depth Soils/Medium moisture
    - Subtype #3: Ponderosa Pine/Bunchgrass/Deep Soils/Less Dry
- Mountain Grassland
    - Subtype #1: Native Parks (Deep Soils/Less Dry)
    - Subtype #2: Brome Parks (Deep Soils/Less Dry)
- Aspen
    - Subtype #1: Colorado Plateau
    - Subtype #2: Terrain-Isolated (stringers)
- Pinyon-Juniper
    - Subtype #1: Ryman Pinyon-Juniper/Shallow Soils/More Dry/Northwest Corner
    - Subtype #2: Pinyon Pine/Black Sage/Shallow Soils/Rim Country
- Mountain Shrubland/Shallow to Mid-Depth Soils/Medium Moisture/Oak and other Shrubs Dominate
- Sagebrush Shrubland

Eight riparian types were identified and are described in depth in the Hydrology Report (Appendix G). The eight riparian types are as follows:

- Low gradient swales/slope wetlands
- Glade Canyon
- High gradient streams
- Headwater transition zones
- Moderately steep, rocky canyons
- Low gradient, deeply incised channels
- Dolores river
- Lentic Areas

Two different water sources feed low gradient swales/slope wetlands present on the Glade:

Uplands sloping into wet meadows. There is one plant association for the upland and one plant association for the bottoms that exist on these sites. Facultative (water-dependent) plant species are present on the bottoms. These are lentic (pooled) wetlands that may be seasonally lotic (flowing).

Depressional wetlands. These are where the water comes from a perched or elevated water table. In these cases the water sits in pools and does not run off.

Of the eleven upland vegetation types and eight riparian/wetland vegetation types, primary concerns exist in the following six vegetation types:

Existing Condition Issue	Allotments	Key Sites
Pinyon-Juniper: Lack of litter, crusts, and mat-formation to minimize overland flow connections	Brumley	Ryman and Plantation pastures, particularly in pinyon-juniper vegetation type
	Lone Mesa	Hunt Creek pasture
Mountain Grassland Parks (Native): lack of native bunchgrasses, poor species composition and high percentage of bare ground	Brumley	Far Draw and Near Draw pastures
	Calf Allotment	Hinchman, Plantation and other pastures with parks
	Mair Allotment	Pole Canyon, Big Water and other pastures with grassland parks
	Salter Allotment	All pastures with parks
Mountain Grassland Parks (Brome): contain areas with continuous water flow patterns	Calf Allotment	Salter Y area
	Sagehen Allotment	Sagehen Park
Mountain Shrublands and Sagebrush Shrublands: Low ground cover, poor species diversity and poor age class diversity	Glade Allotment	Lower East and West pastures, Horse pasture, and North Lake pasture
	Long Park Allotment	Ormiston Point and Lake pastures
	Mair Allotment	Pole Canyon pasture
	Salter Allotment	Ferris and Willow Draw pastures
Swales (mostly in grass parklands): poor plant species composition with little riparian vegetation and in some locations bare banks	Calf Allotment	Hinchman and Plantation pastures and other pastures with parks
	Long Park Allotment	Long Park and other pastures with parks
	Mair Allotment	Big Water pasture and other pastures with parks
	Salter Allotment	All pastures with parks

3.3.2 Desired Conditions

While desired conditions were determined for each vegetation type and subtype, only those where existing conditions differ from desired conditions are described here. Where desired conditions are essentially the same as existing conditions, management will focus on maintaining the current desired condition status.

Vegetation Type	Desired Condition
Pinyon/juniper	• Common species include black sage, Gambel's oak, snowberry, trailing fleabane, sun sedge, prairie junegrass, mountain muhly grass, squirreltail grass, and blue grama • Sagebrush intermixed with pinyon-juniper is actually part of this vegetation type

Vegetation Type	Desired Condition
	• Cheat grass is isolated and decreasing • Shortgrasses form continuous sod where they exist • Midgrasses have well-formed bunches growing close together with abundant seed stalks. Bunchgrasses present and robust • Crusts are in various stages of development but include a few areas where they are well-developed • Less than 10% bare ground in a discontinuous pattern. Litter, crust, and/or vegetation are well distributed and adequate to capture water and prevent soil movement in most places • Rills and pedestals are stable and healing
Mountain Grassland Parks (Native)	• Common species include Arizona fescue, mountain muhly, timber oatgrass, Parry's oatgrass, native brome species, and sand dropseed. • If small isolated populations of nonnative invasive species are present, they are declining • Bare ground is less than 10% • Litter makes up at least 30-50% • 40-60% vegetation basal cover (mostly bunchgrass), bunchgrass seed stalks are 20-30" high. Clumps are moderate to highly developed and closely spaced. • Live bunchgrass clumps are present and have the highest relative dominance and density of any vegetation.
Mountain Grassland Parks (Brome)	• Common species include smooth brome, Kentucky bluegrass, Timothy, intermediate wheatgrass, and orchard grass. Smooth brome dominates. • Brome stalks are about 6" high. Seedheads are present. • Bare ground is less than 10% in a discontinuous pattern so that water flow patterns are not connected; litter, or vegetation is well distributed and adequate to capture water and prevent soil movement in most place.
Mountain shrubland	• Common species consist of Gambel's oak, snowberry, chokecherry, serviceberry, Wood's rose, mountain big sagebrush, upland sedges, slender wheatgrass, western wheatgrass, native brome grasses, Letterman's needlegrass, aspen peavine, trailing fleabane, western yarrow, American vetch, and silver lupine. Decreasing populations of invasive species such as rabbitbrush, Kentucky bluegrass, mulesear, and cheatgrass. Decreasing noxious species such as Canada thistle. Diverse age classes of shrubs, including sprouts and seedlings are present. • 50-70% of vegetation basal cover is grasses; 5-10% is forbs; 20-30% is shrubs; and 5-10% is trees. • Less than 10% bare ground. • 70-80% litter is 1-2" deep (except immediately after disturbance). • Bare ground is in a discontinuous pattern so that water flow patterns are not connected; litter, crust, or vegetation is well distributed and adequate to capture water and prevent soil movement in most places.
Sagebrush Shrubland	• Common species include basin big sagebrush, Wyoming big sagebrush, cliff fendlerbush, fourwing saltbush, Utah serviceberry, mountain mahogany, antelope bitterbrush, mutton grass, western wheatgrass, Indian ricegrass, bottlebrush squirreltail, prairie junegrass, slender wheatgrass. • Where present, cheatgrass is stable or decreasing. • Less than 10% bare ground. • Bare ground is in a discontinuous pattern so that water flow patterns are not connected; litter, crust, or vegetation is well distributed and adequate to capture

Vegetation Type	Desired Condition
	water and prevent soil movement. • Rills and pedestals are stable or healing.
Swales	• Saturated at or near the surface in relatively frequent events. • Riparian-wetland area widening or at potential extent. • Diverse composition of riparian vegetation that includes water sedge, beaked sedge, common spikerush; minimal amount of forbs. • Continuous mat of riparian species providing adequate cover to protect soil surface. • System is vertically stable or if system was vertically unstable before, the riparian width is likely to be limited by the width of the incised channel; however, it is no longer downcutting, vegetation is stabilizing the bed and banks, previously bare areas are covered with a continuous mat of riparian species, and headcuts are no longer actively eroding.

3.3.3 Environmental Consequences

There are effects to soil, water, upland and riparian plant communities, invasive plants, biological diversity, and the inter-relationships between all of these as a result of livestock grazing. Grazing can have a negative, neutral, or positive effect on the landscape, depending on the ecosystem, environmental conditions, length of grazing, timing of grazing, and grazing intensity. Impacts from livestock grazing can generally be placed into one of three categories: impacts to vegetation, impacts associated with water, and trampling. Impacts to vegetation are perhaps the most profound and will be discussed here. Impacts to water are discussed under the Watershed and Water Quality section. Other impacts will be examined in the Range Resources section.

Grazing effects on plants occur above ground and below ground, and often simultaneously. These effects range from almost undetectable to quite severe, and the magnitude of effect depends on frequency, intensity, and season of use of the plants being grazed. At the level of an individual plant, grazing may increase, decrease, or not affect plant growth (Trlica and Rittenhouse 1992).

The majority of plants consumed by livestock are graminoids, but forbs and shrubs (to a lesser extent), are also used. When grasses and grass-like plants are eaten, the plant is normally not killed but may cease growing for the year, depending on the time of year. The plant has either been able to grow before grazing (producing and storing carbohydrate in its root system), or it may be able to continue growing after it has been grazed to further produce energy and store in the roots. Many grasses that are eaten prior to setting seed can expand vegetatively through tillering. Grazing stimulates this process. Grazing that happens after these grass plants have produced and set seed does not interfere with reproduction. Allowing grazing under a controlled system of use where timing, duration, and intensity of grazing are managed, limits negative effects to plants and can enhance positive effects. If livestock are allowed to concentrate in certain areas and re-graze the same plants again and again, the effects to plants can be severe and long-lasting. Also, during drought conditions, early grazing without enough moisture for recovery sets back plant production and root system growth. Although impacts from a single season can be mitigated through management in following seasons, recovery from multiple years of impact can take much longer.

When forbs are grazed, it can be difficult for the plant to re-grow the leaf material consumed during the season. If a majority of the plant is consumed before the forb produces flowers, reproduction is unlikely that year unless it is a species that can reproduce vegetatively by the use of stolons. Forbs wither relatively quickly after seed set. If individual forb plants are grazed to ground level, especially on a recurring basis and prior to reproduction, the effect to those plants and the overall population is negative.

Grazing affects ecosystem development and succession as well as plant communities (Joern and Keeler 1995). Grazing can alter ecosystem response to factors such as climatic changes over long periods, soil development, and plant and animal interactions within the system. Selective grazing can lead to changes in plant species and composition, which in turn affects the structure and function of the plant community. Effects are widespread, influencing everything from competing herbivores to microflora and microfauna. When management is applied appropriately, in the correct season, and with suitable intensity, grazing can be used to manipulate vegetation to attain desired management objectives (CAST 2002).

Some easily-accessed riparian plant communities may get more use than other upland areas of the same pasture even when livestock are managed properly. If salt or mineral is not used or ill-placed, its effects as an attractant are minimized or absent. Ineffective herding or failure to move livestock to the lesser-used areas of a pasture contribute to over-use of riparian areas or favorite feeding sites. Failure to completely sweep or clean a pasture of all livestock upon moving to a new pasture leads to over-use of preferred areas and preferred plants in already-used pastures. When livestock are left behind, they continue to congregate on their favorite spots and re-graze areas that have been previously grazed. This further damages plants that have already received an impact. When improper management coincides with periods of drought, negative effects on the ground are amplified. The result is that in poor years (poor management combined with poor environmental conditions), livestock may end up staying too long in certain areas of a pasture and in good years, the cattle may not be providing enough use to stimulate production and vigor of the vegetation across the pasture or allotment. It is important for permittees to set themselves up to be as flexible as possible to respond to changes in climate and vegetative conditions quickly enough to promote desired effects.

To understand impacts from livestock grazing on vegetation, it is good to have an understanding of livestock management tools and how those tools are used to change livestock impacts on vegetation. These tools are described as follows:

Season of Use - The season of use should be changed every year for each pasture within an allotment. On the Glade, some pastures are grazed at the same time every year while others have the season of use and dates of use switched yearly. Early use of a pasture means that once cattle leave, the plants have the rest of the grazing season to continue to grow and recover from the effects of livestock grazing. The late use pastures have gone through their growing season without disturbance and have often been able to ensure reproduction, but have a short recovery period. The extent of recovery depends on moisture.

In general, when using a pasture in the middle of the season, livestock will spend a proportionately larger amount of time in riparian areas. Sedges and other riparian grasses are in active growth phases and therefore more palatable as compared to other areas of the

pasture. Livestock often seek more water this time of year as well given warmer temperatures. Trampling most likely occurs in the middle of the growing season when riparian use is highest. Depending on the length of the grazing season and its relative timing, plants may have time to grow prior to grazing and may have recovery time after grazing.

In general, grazing a pasture later in the summer season or fall means that livestock will likely be changing forage preference and consuming those plants that are curing the slowest and retaining their nutritional value. Riparian grasses will no longer be favored, and livestock uses will likely shift to upland grasses such as mountain muhly, a late season grass. Plants grazed later in the season have had the growing season to reproduce and store energy root systems. As protein values drop in herbaceous plants, livestock may browse shrubs to some extent, depending on what else is available. If a particular pasture is showing negative effects related to a specific characteristic (i.e. percent of Thurber fescue is consistently decreasing), then management could be changed to graze that particular pasture/plant late in the season or in mid-season, and avoid grazing it when it is most susceptible to negative effects.

Number of Cattle - Decreasing numbers during drought or other periods of low-precipitation helps to balance decreased forage production with decreased consumption. Fewer cattle also means that there is less competition between animals, so that may actually leave animals to be more selective about the forage they consume – allowing them to "take the best, and leave the rest". This may give the competitive advantage to less palatable species. Fewer cattle may lead to less trampling in riparian areas. Social interactions between fewer livestock may mean a tendency for them to stay grouped together and to not range as far (decreased distribution).

Increased numbers may be warranted following years of above-average precipitation and production. Increased numbers may be beneficial if there are pastures needing a reduction in layers of previous years' grass litter. Increased numbers increase the social interactions between individuals and groups of cattle. They may have more of a tendency to split into small groups and cover more ground (increased distribution). They may eat a wider variety of plants because of increased competition. Increasing numbers may lead to more pronounced trampling effects. Increased livestock numbers may be offset by a shorter grazing season.

Kind of Livestock - Pairs of cattle (mother cow and her calf) may have more of a tendency to stay on the most productive parts of the range since the cow has to meet nutritional needs of a nursing calf. Pairs also tend to range less in some breeds, especially when calves are young. In general, dry cows (non-lactating animals) have a broader diet than pairs; they tend to range more and have lower input needs. Their nutritional requirements are lower than those of lactating cows or yearlings. Yearlings have the greatest tendency to roam, which can be good for situations where improved distribution is desired. However, they are more difficult to keep within designated pastures as they push fences and wander farther. Yearlings have to meet higher nutritional requirements than dry cows because of their body demands related to growth and energy. The effects of stocking bulls are not discussed here, because although bulls are run as part of the herd, stocking a herd of only bulls would not be considered.

The breed of livestock also can make a difference in how the land is used. For example, the Corriente breed is known to have smaller weights (thus eat less) but can graze steeper more rugged country. Brahman breeds are known to withstand harsh climates and rough grazing

conditions. Some livestock have been bred for specific conditions such as brisket disease. Brisket disease is caused by pulmonary arterial hypertension, circulatory edema and congestive heart failure as a result of low-pressures associated with low-oxygen high-altitude grazing.

Intensity and Duration - The general effects of increasing grazing intensity (more cows grazing in a smaller area for shorter time periods) are to significantly increase the competition between cows and cause them to be less selective in their diets. This means livestock would eat a wider variety of plants – including those that are less palatable (grass plants with litter accumulations, or secondary range plants, or increasers [plants which increase under grazing pressure = less palatable species]). The higher intensity can also lead to increased trampling effects which may be negative in the case of loose upland soils, or positive in the case of upland areas where organic matter needs to be incorporated into the soil, increasing soil nutrition and assisting with the spread and germination of seed.

The general effects of decreasing grazing intensity (lower numbers of cows grazing in larger areas, often for longer time periods) are to decrease competition between cows, making them more selective. Given this situation, livestock will select more palatable species. The added pressure on palatable species reduces pressure on undesirable species which can become more dominant on a site. Decreased grazing intensity may also allow livestock to remain in larger groups and range less. The effect of less travel could increase livestock impacts in specific "favored" areas, including riparian areas and areas with highly palatable forages.

Herding - The effect of herding to distribute livestock is totally dependent on the skill, knowledge, and application of technique by the herder. Done correctly (low-stress handling, consistent moving/dissuasion, movement to a quality area, settling), herding is highly effective at dissuading livestock from using areas of concern. Herding can also be used to encourage livestock use in certain areas such as pockets of forage in areas distant from water or places where litter accumulations are high. The effects would be to move use from areas where livestock already have an established preference and impact into areas where there are little to no impacts. It spreads the use in an effort to better balance the impacts to resources from livestock grazing. Repeat consistent herding can be used to "train" the cow and program her calf. Culling out cows that won't cooperate (learn) also helps in the long-term management of the herd.

Full-time Rider - A full-time rider is a person or persons that are on the allotment a minimum of 5 out of 7 days. They are be checking to make sure livestock are utilizing each pasture proportionately so that all suitable acres are used and no areas exceed proper use guidelines. The rider makes sure proper livestock distribution is obtained with the help of salt and minerals. Low stress herding techniques can be used to repeatedly move livestock away from favorite areas and towards less favored areas. Realizing livestock need to come back to ponds to water, and many ponds are in open parklands, it is crucial for the rider to time his/her visits to ponds when cattle are done drinking and chewing their cud and are ready to graze again. While older cows may be accustomed to staying around ponds to graze and may be harder to move, this is a good training routine for young calves, particularly if they are to become part of the base herd in the future. The rider can also be valuable in helping to select cows or heifers for retention or replacements that display a preference for uplands as opposed to riparian areas.

Having a full-time rider can add costs to a livestock operation. Costs include wages, vehicle and trailer use, fuel, horses, often living costs are involved, insurance and other costs. This is, however, a built-in cost of doing business when a permittee cannot spend the necessary time to manage their livestock themselves or their herd is large enough that additional help is required.

Resting - Resting a specific area provides at least a growing season (or longer, depending on what might be necessary) for plant, water, and soil resources to grow or function without the effects of livestock grazing. Plants grow, reproduce, and store energy in roots and biomass. Soil is not disturbed by livestock, and water is not consumed by cattle. Manure and urea from livestock is not left by cattle. Seed dispersal relative to livestock does not take place. Litter accumulates. Certain areas can be rested for as long as necessary to produce the desired conditions in those locations. Prolonged rest (1 to 3 years) may at times be required following catastrophic events such as wildfire.

Splitting or Combining Pastures - Existing pastures can be subdivided to create additional pastures for rotation. The effect of adding pastures to the rotation by subdividing existing pastures is much like herding, it is used to distribute livestock. Livestock distribution may be improved with longer periods of rest and deferment, allowing plants more growth and energy storage. Fencing may be permanent or may consist of temporary (electric) fencing to meet short-term needs.

Combining pastures increases the area that livestock have to roam and forage within. The effects depend on the amount of time livestock remain in the larger pasture. This may allow livestock to become more selective in their diets and select only the best forages, remaining in the areas producing those plants to the likely exclusion of other areas. If allowed to stay longer, additional least palatable plants may be consumed (a positive) or the more desirable plants may be grazed multiple times (a negative). If additional riparian areas are added to the pasture as a result of combining pastures, that means that livestock use and impacts to these areas is spread between several riparian habitats, effectively reducing the overall impact on all riparian, unless livestock stay longer.

Adaptive Management – Adaptive management is a process used where changes are made to address resource issues, monitored, and if desired changes are not seen within a defined timeframe, then additional changes are made until desired results are acquired. Given specific desired outcomes with well-defined timeframes, both the grazing permittee and the US Forest Service have a clear understanding what is expected and by when. Adaptive management also provides a clear understanding of what is to occur should results not be achieved.

Monitoring - Monitoring key areas provides insurance to all management actions. Important implementation monitoring for allowable use or other annual impact monitoring normally focuses on key areas – since key areas have been chosen to show the effects of livestock grazing and its management in the most sensitive vegetation communities or sites. If a permittee does a good job of pasture management, the effect is often more even distribution of cattle and grazing use across a pasture. Promoting even use means that previously ungrazed plants will have more chance of being grazed (stimulating growth) and that individually, frequently grazed plants will be grazed less (rest/recovery). Achieving more even pasture use

may mean that permittees are allowed to let their livestock stay longer in a particular pasture as opposed to moving quickly through pastures if cattle are allowed to congregate. This system encourages responsible management as it rewards permittees for good management (stay longer) while poor performance is resolved or penalized (move sooner).

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

The overall effect of no livestock grazing would be positive in the near-term for upland rangeland and soil conditions, particularly for those sites currently in less than satisfactory condition. Vegetation both on uplands and in riparian areas would not be utilized to the extent that now occurs. Utilization of vegetation by wildlife, particularly deer and elk, would be negligible on most sites. Compaction of soils, bank trampling along streams, springs and wetlands would be none to slight depending on wildlife concentrations.

On grassland sites, increases in litter accumulation and decreases in bare ground would occur, which in turn would provide additional water holding capacity and a decrease in soil movement and erosion. Improvement to satisfactory soil cover conditions would occur relatively rapidly; in most cases within a couple of years. On sites where reasonable amounts of desirable native species still exist, their expansion would be expected to occur.

Reaching a satisfactory vegetative condition (desired condition) would be slower on those grassland sites that have been severely degraded. Given enough time, native bunchgrass species would slowly recover where they currently exist. Small isolated pockets of native species would expand as soil moisture is maintained and competitive species are not given the advantage. Soil cover condition would rapidly increase due to increases in litter accumulation and decreases in bare ground, which in turn would provide additional water holding capacity and a decrease in soil movement and erosion. Gullies and headcuts created in the past due to grazing would begin to heal.

Degraded sites have much of the desirable vegetation lacking or absent, particularly the desirable native bunchgrasses. Weedy competitive species dominate. Soil has been lost through erosion, soils are compacted and natural seedling establishment would be difficult. Based on excluded areas where transects exist, progress toward desired vegetative condition would be positive but achievement of satisfactory conditions would take many years. Drought could slow or stop progress temporarily.

However, given that the rangelands of the Glade Landscape evolved with periodic disturbance (such as wildfire or wildlife grazing/browsing), loss of an important disturbance factor in terms of livestock impact can also be detrimental. If enough time persists where no grazing occurs, plant litter accumulation may increase to the point that negative effects to plant vigor and viability could occur. This can result in alteration of plant species composition, invasion by woody species, and increases in bare ground as grass plants mature and stagnate. There may be enough big game grazing in the Glade area to prevent this from happening. If not, plants may become decadent and reduce productivity.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

Management problems exist under the Current Grazing Alternative that would continue to impede improvement in vegetative and soil condition. Livestock distribution continues to be a

problem, resulting in utilization that is too heavy in many grassland parks. A true deferred grazing system is often not possible due to pasture sizes and elevations. A rotation system is not to exceed 45% utilization and many areas on the Glade are grazed well above this.

While additional fencing, stock ponds and stock trails have been in place for improved management since 1975, many stocking levels have been unchanged since the 1950's. Where trend studies currently show a stable to downward trend, it is likely under this alternative that conditions would stay much the same, or possibly deteriorate more rapidly given prolonged drought conditions. This could result in the need to reduce permitted numbers and/or seasons on some allotments as indicted by monitoring.

The combined result of factors discussed above is a static or slow negative change in vegetative and soil cover condition in those areas currently of concern such as swales and grassland parks. This would be the result of excessive stocking levels, excessive periods of grazing, lack of regular deferment, poor livestock distribution, and prolonged drought. In some cases, these areas would continue to dry out, given shallow rooted, non-native grass species and a predominance of bare ground. This in turn can lower soil moisture and water table levels and associated forage production.

Currently, there is little flexibility to change management without hardship to permittees, in order to respond to natural conditions such as drought and fire, or to manage activities, including vegetation treatments like prescribed fire or seeding, or to respond to insufficient management. Through drought years the only option to decrease pressure is to decrease livestock numbers or grazing season, or provide a complete rest in some pastures. Permittees on several allotments have a track record of reducing livestock numbers, the season of use, or both when resource conditions including drought exist. In numerous meetings with the permittees throughout this environmental assessment process, all have stated that their intent is to continue this practice into the future.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Many of the general effects of grazing discussed under Alternative B apply to this alternative as well. Alternative C would allow an increase in the amount of residual vegetation in grassland parks after grazing given managed utilization levels. Allowable use levels would, for the most part, meet Forest Plan criteria. Grass parklands would see an increase in soil cover due to decreased grazing intensity and shorter grazing periods in those pastures.

As a result of fully implementing the proposed actions, design criteria and/or adaptive management, soil cover condition would be improved and forage productivity would be expected to increase toward satisfactory levels. Likely the first visible effect would be an increase in soil cover, due to a greater annual accumulation of litter and an increase in plant basal area. Incorporating rest one out of three years on pastures entered first every year would allow desirable plants, especially bunchgrasses, to develop, reproduce, and put down root reserves without grazing every year. This would in turn increase vigor and tillering with a resulting increase in plant size and litter cover.

Vegetative condition would improve on sites now in less than satisfactory condition. Improved condition would occur more rapidly on key areas, such as grasslands and more mesic

environments such as swales. As a result of increased ground cover, soil loss would be less and retention of soil moisture would increase. Less intense grazing would allow for tillering of existing desirable plants, more available water for plant growth, better root reserve production and better seed establishment. The overall result would be an increase in desirable species because of these factors, including the expansion of existing native bunchgrasses. Some changes like increased groundcover would occur more rapidly than other changes such as the expansion of native bunchgrasses.

Forage production would be expected to increase toward site potentials. Initially, plant vigor would increase, due to the same factors addressed above. Through time, a change in plant composition toward a more desirable native mix of bunchgrasses and forbs would be expected. Our data indicates that sites in satisfactory condition tend to produce more forage than unsatisfactory sites. This is particularly true for grasslands. Species that are associated with higher ecological condition generally produce more pounds per acre. Examples are desirable native bunchgrasses like fescues and needlegrasses, which tend to produce more reliable forage than grasses that are more resistant to grazing and susceptible to drought, like Kentucky bluegrass. High seral forbs like groundsel, goldenrod, American vetch and aspen fleabane tend to produce more forage than weedier species such as dandelion, trailing fleabane and knotweed. It is important to note that research has shown that on native ranges, regardless of condition, forage production can increase by as much as 13 – 28% when moderate or light stocking rates are employed, compared to heavy stocking. Data suggests that higher forage production would be attained under the Proposed Action compared to current management (Holochek et al, 1998).

Where changes are expected, one of the first visible effects would be an increase in soil cover, due to a greater annual accumulation of litter and an increase in plant basal area. Without regular deferment, desirable plants, (especially bunchgrasses) lack vigor and improvements in plant development, reproduction and root reserves do not occur. Proposed and adaptive management allows this improvement to take place in those pastures that were grazed first every spring. Based on the processes described above, vegetative condition would slowly improve on sites that are now in less than satisfactory condition. As a result of increased ground cover, soil loss would be less and retention of soil moisture would increase.

Additive factors across the landscape of some allotments having fewer livestock numbers (Mair, Long Park), in some cases periodic shorter grazing seasons (Salter), more effective livestock distribution, later on dates, earlier and lighter use in riparian areas, combining small pastures, and a renewed commitment by the permittees for cooperative monitoring and allotment management should result in progress toward desired conditions.

Currently, there is little flexibility to change management without hardship to permittees, in order to respond to natural conditions such as drought and fire, or to manage activities, including vegetation treatments like prescribed fire or seeding. Through drought years the only option to decrease pressure is to decrease livestock numbers or grazing season, or provide a complete rest in some pastures. Permittees on several allotments have a track record of reducing livestock numbers, the season of use, or both when resource conditions including drought exist. In numerous meeting with the permittees through-out this environmental assessment process, all have stated that their intent to continue this practice into the future.

Alternative C meets the purpose and need of improving current vegetation and soil conditions while maintaining viable livestock operations by authorizing livestock grazing on the Glade landscape.

3.4 Invasive and Noxious Plant Species

Specific legal and regulatory direction, programmatic direction, desired conditions, and program objectives can be found in the San Juan National Forest Land and Resources Management Plan EIS (USDA 2013). FS agency-wide direction can be found in FSM 2900. Programmatic NEPA, Best Management Practices (BMPs), and Standard Operating Procedures (SOPs) can be found at Management and Control of Noxious Plants on the San Juan/Rio Grande National Forests (USDA 1996). Guidance is also found in the USDA – Forest Service 1997 Guide to Noxious Weed Prevention Practices.

An *invasive species* is a plant (or animal) that is not native to a specific location (i.e. introduced) and has a tendency to spread, which is believed to cause damage to the environment, human economy and/or human health. A *noxious weed* is a weed that has been designated by an agricultural authority as one that is injurious to agricultural or horticultural crops, natural habitats or ecosystems, or humans or livestock. Although they mean different things, these terms are often used interchangeably since many plants fall into both categories.

Noxious weeds are designated by each state in the United States. A weed may be designated noxious in one state but not in another. In Colorado, each noxious weed specie is placed on a status list with management goals described as follows:

- *List A Species* in Colorado are designated by the Commissioner for eradication.
- *List B Species* are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.
- *List C Species* are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.
- *Watch List Species* have been determined to pose a potential threat to the agricultural productivity and environmental values of the lands.

3.4.1 Affected Environment

Often times, weed treatment is restricted based on time and funding constraints. Therefore, identifying priority species for treatment is necessary. Species considered a "High priority for treatment" are generally low in abundance, feasible to control, have the ability to establish dominance in plant communities, or invade a variety of relatively healthy ecosystems. The following species have been identified as high priority species for treatment on the Dolores Ranger District:

SPECIES	ACRES	STATUS
Russian knapweed (*Acroptilon repens*)	138	List B
Spotted knapweed (*Centaurea maculosa*)	267	List B
Diffuse knapweed (*Centaurea diffusa*)	5	List B
Hoary cress (*Cardaria draba*)	9	List B
Houndstongue (*Cynoglossum officinate*)	41	List B
Leafy spurge (*Euphorbia esula*)	8.5	List B
Dalmatian toadflax (*Linaria dalmatica*)	6	List B
Yellow toadflax (*Linaria vulgaris*)	8	List B
Sulfur cinquefoil (*Potentilla recta*)	2	List B
Oxeye daisy (*Chrysanthemum leucanthemum*)	126	List B
Perennial Pepperweed/White Top (*Lepedium latifolium*)	14	List B
Musk thistle (*Carduus nutans*)	16,481	List B
Bull thistle (*Cirsium vulgare*)	29	List B
Scotch thistle (*Onopordum acanthium*)	1	List B
Canada thistle (*Cirsium arvense*)	6,498	List B

The following table identifies invasive species that pose a potential threat for invasion onto San Juan National Forest administered lands. This potential is due to their known occurrences being in close proximity to local public lands.

In the event that potential invaders are found on public lands, early detection rapid response methods will be used as follows:

- Systematic – as opposed to random – inventories
- Recurring monitoring along transportation systems and other spread vectors
- Timely treatment
- Notification of internal staff, partners and cooperators regarding the problem

Invasive Species	Status	Comments (last updated in 2012)
Dyer's woad (*Isatis tinctoria*)	List A	1 acre infestation found 1 mile west of Dove Creek, CO along Highway 491.
Camelthorn (*Alhagi pseudalhagi*)	List A	Found in SE San Juan County, UT in the Montezuma Creek vicinity.
Yellow starthistle (*Centaurea solstitialis*)	List A	Found in Mesa and Montrose Counties, CO, and along Hwy 140 ~ 5 mi. south of the NM State line.
African rue (*Peganum harmala L.*)	List A	Found in Farmington, New Mexico area.
Squarrose knapweed (*Centaurea virgate*)	List A	Found in Utah.
Orange hawkweed (*Hieracium aurantiacum*)	List A	Found in Northeast Colorado.
Purple loosestrife (*Lythrum salicaria*)	List A	Found along the San Miguel River, San Miguel County, CO.

Invasive Species	Status	Comments (last updated in 2012)
Medusahead rye (*Taeniatherum caput-medusae*)	List A	Found in Nevada and Utah.
Mediterranean sage (*Salvia aethiopis*)	List A	Found along County Road 29 in Montezuma County, CO. My also be on private land in the Animas Valley.
Bouncingbet (*Saponaria officinlis*)	List B	Found on private lands in Archuleta County, CO., County Road 250 East Animas Road.
Giant salvinia (*Salvinia molesta*)	List A	Aquatic weed that has the potential to invade from long distances through water and water related activities.
Hydrilla (*Hydrilla verticillata*)	List A	Aquatic weed that has the potential to invade from long distances through water and water related activities.
Eurasian watermilfoil (*Myriophyllum spicatum*)	List B	Recently discovered in Colorado. Aquatic weed that has the potential to invade from long distances through water and water related activities.

Inventory, monitoring and treatment of noxious weeds on the Dolores Ranger District is an ongoing program of work. Work is completed through private contracts, county programs, seasonal crews and permanent staff to manage the weed program. Specific areas and vectors for weed control have been identified and are target treatment areas. They are as follows in order of priority:

Roads: Roads are the primary vector for the spread of noxious weeds since seeds readily travel onto the forest from motor vehicles. Roads are divided according to maintenance levels by the San Juan national Forest as follows:

Maintenance Level
Level 1 – Custodial Care
Level 2 – High Clearance Vehicles
Level 3 – Suitable for Passenger Cars
Level 4 – Moderate Degree User Comfort
Level 5 – High Degree User Comfort

The Forest Service Region 2 strategy is to conduct inventory, treatment and monitoring of level 3, 4, and 5 roadways on at least a 3-year cycle. The Glade landscape has approximately 92 miles of level 3-5 roads. Roads level 1, 2 and other non-system roads are inventoried as parts of other projects such as timber sales, fuels projects, travel management, etc.

System Trails: Trails are a primary vector for the spread of noxious weeds due to both motorized, mechanized and non-motorized travel sources for seeds. In some ways, trails can be worse than roads since they travel into remote areas where weed treatment is more complicated, requiring more time, money and energy. Trailheads are key areas to maintain control over noxious weeds. The Glade landscape has approximately 18 miles of both motorized and non-motorized system trails.

Administrative Sites and Facilities: Facilities include work stations, ware yards, offices, dwellings, and fire lookouts. The Glade contains only a few of these facilities such as Benchmark Lookout and the Dolores Guard Station.

Recreation facilities: These facilities include campgrounds, both developed and dispersed, as well as interpretive sites, boat launch areas and fishing accesses. These areas are vectors for noxious weed spread due to the number of people with vehicles using them, possibly carrying weed seeds from off-site. Several recreation facilities exist along the Dolores River within the Sagehen Allotment. These facilities should be inventoried and treated annually.

Range Facilities: The Glade contains numerous facilities tied to livestock management including horse pastures, corrals, and cow camps. These areas concentrate livestock and human use including vehicles all of which are vectors for weed seed transport. Annual inspections and treatment are required to avoid the spread of noxious weeds. Range facilities located across the Glade landscape analysis area are as follows:

Allotment	Corrals	Reservoir	Springs	Cow Camp
Brumley	1	45	8	1
Calf	3	23	-	1
Glade	1	34	4	-
Lone Mesa	-	21	-	-
Long Park	-	22	-	-
Mair	2	63	9	1
Sagehen	2	-	1	-
Salter	-	27	-	1
TOTALS	9	235	22	4

Certified weed-free hay is required for anyone feeding stock on the Dolores Ranger District. Weed-free hay or straw is grown in fields that are free of any viable plant parts of any of the plant species listed on the State Noxious Weed List or North American Invasive Species Management Association Noxious Weed List. In order to be certified the product must pass an inspection.

Project Activities: Project activities associated with ground disturbance such as timber harvest, oil drilling, range improvements, and road/trail construction are vulnerable to the establishment and spread of noxious weeds. Therefore, a pre-disturbance inventory of existing noxious weeds and their treatment is often recommended with follow-up monitoring and treatment if necessary.

Livestock: Results of a literature search remain inconclusive regarding whether or not livestock spread weeds or help control them. Outcomes depend upon timing and intensity of grazing, what livestock have consumed prior to coming into a new pasture, timing of precipitation, where weeds occur on the landscape and in what density, species of weed, and health of surrounding vegetation communities. Because of the possible combination of variables, it is impossible to draw solid conclusions about an increase or decrease in invasive species.

A snapshot of the weed issue for the past 10 years in each allotment within the Glade landscape is as follows:

Allotment	Weed Species Found	Acres Treated
Brumley	Canada thistle, Musk thistle, Russian knapweed, Dalmation toadflax	206
Calf	Canada thistle, Musk thistle, Dalmation toadflax, Whitetop, Bull thistle	923
Glade	Canada thistle, Musk thistle, Bull thistle, Spotted knapweed, Dalmation toadflax	415
Lone Mesa	Canada thistle, Musk thistle, Russian knapweed	0
Long Park	Canada thistle, Musk thistle, Bull thistle, Dalmation toadflax, Whitetop	105
Mair	Canada thistle, Musk thistle, Bull thistle, Russian knapweed, Spotted knapweed	253
Sagehen	Canada thistle, Musk thistle, Bull thistle, Dalmation toadflax, Whitetop, Spotted knapweed, Diffuse knapweed	865
Salter	Canada thistle, Musk thistle, Bull thistle	156

While weed species are found in every allotment across the Glade landscape, allotments known to have heavy infestations and targeted for specific management are as follows:

Existing Condition Issue	Allotments	Key Sites
Dryland pastures of pinyon, juniper, oakbrush, ponderosa pine: Increase and spread of invasive species	Brumley	Royce and Ryman pastures
	Calf Allotment	Allotment-wide but particularly Plantation pasture
	Glade Allotment	Lower East and West pastures
	Lone Mesa Allotment	Hunt Creek pasture
	Long Park Allotment	Ormiston Point pasture
	Mair Allotment	Pole Canyon pasture
	Sagehen Allotment	Sagehen Park, Below McPhee dam and areas surrounding McPhee reservoir and its tributaries

It is also important to talk about cheatgrass (*bromus tectorum*), a fast spreading annual invasive grass species. Cheatgrass usually germinates in the autumn, overwintering as a seedling, then flowering in the spring or early summer. It has an extensive root system. The wide-spreading lateral roots are one of the keys to the survival of this plant. A study showed that it had the capability to reduce soil moisture to the permanent wilting point to a depth of 28 in, reducing competition from other species.

Cheatgrass is most prevalent in lower country but has been slowly creeping up in elevation. It is well established at the lower elevations on all Glade landscape allotments. While livestock

management efforts try to reduce the spread of cheatgrass; when over-use by livestock occurs, reducing ground cover and exposing bare soil, cheatgrass tends to become established.

3.4.2 Desired Conditions

The overall goal for the Glade landscape regarding noxious weeds and other invasive species is to maintain sufficient residual cover in the form of plants, litter and biological crusts to reduce bare ground where weedy species become established. The Invasive Species Action Plan for the San Juan National Forest (2012) specifically lists the following desired conditions for noxious weed management:

- Invasive species, both terrestrial and aquatic, are absent or rare within the planning area, and are not influencing native populations or ecosystem function.
- Invasive species management is successfully coordinated with adjacent land owners.

3.4.3 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

Not permitting livestock grazing would not change the need to manage invasive species. Noxious plants would be managed according to the Invasive Species Action Plan (2012). One of the possible biological methods would be to use livestock such as goats and sheep to implement weed control. This would, however, not be performed under a Term Grazing Permit. Any efforts to use permitted livestock to control weeds would end.

Some reduction in the spread of weeds may be evident given the reduction in livestock use on the Glade landscape. The introduction and spread of weed seed through range facilities such as cow camps, corrals, and horse pastures as well as by livestock would eventually be eliminated once facilities are gone and current weed infestations are eradicated at those locations. Any spread of weeds from fecal matter, equipment, or feed associated with permitted livestock would be eliminated.

The No Livestock Grazing Alternative would likely result in more ground cover in the form of litter, plant density and biological crusts. This would reduce bare ground for weed establishment.

This alternative has the least potential to increase the spread of invasive plant species.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

Continuing to permit livestock grazing would not change the need to manage invasive species. Noxious plants would be managed according to the Invasive Species Action Plan (2012). One of the possible biological methods would be to use livestock such as goats and sheep to implement weed control. This would, however, not be performed under a Term Grazing Permit. Any efforts to control weeds by permitted livestock would continue.

No change in the spread of weeds from permitted livestock would be evident given such grazing would continue on the Glade landscape. The introduction and spread of weed seed through range facilities such as cow camps, corrals, and horse pastures as well as by livestock

would continue. Any spread of weeds from fecal matter, equipment, or feed associated with permitted livestock would continue.

Areas of insufficient ground cover as a result of current livestock management would likely continue. The lack of ground cover in the forms of litter, plant density and biological crusts provide bare ground for weed establishment.

This alternative has the greatest potential to increase the spread of invasive plant species.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Changes in livestock management under the Proposed Action would not change the need to manage invasive species. Noxious plants would be managed according to the Invasive Species Action Plan (2012). One of the possible biological methods would be to use livestock such as goats and sheep to implement weed control. This would, however, not be performed under a Term Grazing Permit. Any efforts to control weeds by permitted livestock would continue. Design criteria and/or adaptive management would be implemented to focus on prevention of new infestations and spread of existing infestations.

No change in the spread of weeds from permitted livestock would be evident given such grazing would continue on the Glade landscape. The introduction and spread of weed seed through range facilities such as cow camps, corrals, and horse pastures as well as by livestock would continue. In both cases, effectiveness of prevention activities would be dictated by the Invasive Species Action Plan (2012).

Areas of insufficient ground cover on the open range as a result of current livestock management would likely be reduced given objectives in this alternative to improve range conditions. An increase in ground cover in the forms of litter, plant density and biological crusts would provide less bare ground for weed establishment.

This alternative would fall in between the other two alternatives in its potential to increase the spread of invasive plant species.

3.5 Threatened, Endangered and Sensitive Plant Species

3.5.1 Affected Environment

Threatened, Endangered, Proposed and Candidate Species

According to the U.S. Fish and Wildlife Service (USFWS), there are 2 federally listed plant species with potential to occur on the SJNF (USFWS 2015). These species are shown in the table below, along with their habitat associations and potential to occur within the project area.

Table 3.2 Endangered plant species on the SJNF

Species	Status	Habitat Description	Potential to Occur on Project Site
Knowlton's cactus (*Pediocactus knowltonii*)	E	Rolling, gravelly hills in piñon-juniper/sagebrush communities at about 6,200 to 6,300 feet elevation. Strongly associated with pea to cobble size gravels (tertiary alluvial deposits of the San Jose Formation) covering a majority of the soil, black sagebrush (*Artemisia nova*), and occurrence of reindeer lichen (*Hypogymnia physodes* var. *vittata*).	While not known to exist within the project area, suitable habitat does exist.
Pagosa skyrocket (*Ipomopsis polyantha*)	E	Found on barren shale, ponderosa pine, piñon-juniper, or scrub-oak communities on the Mancos shale Formation. 75% of its population has been located on disturbed sites such as roadsides, residential or pasture lands. Elevation 6,750-7,775 feet.	While not known to exist within the project area, suitable habitat does exist.

E=Endangered

Sensitive Species

There are 23 sensitive plant species known or suspected to occur on the San Juan National Forest based on the February 2015 Matrix for Forest Service Region 2. Of these, 17 are known to occur, or have potential to occur on the Dolores Ranger District. Only four, however, have the potential to occur within the project area (Table 3.3). The remaining 13 sensitive plant species with no habitat in the project area have been eliminated from detailed evaluation.

Table 3.3 Sensitive plant species with potential to occur in the project area

Species	Habitat
Giant helleborine orchid (*Epipactis gigantea*)	Seeps on sandstone cliffs and hillsides; springs, hot springs, 4800'-8000'.
Lone Mesa snakeweed (*Gutierrezia elegans)*	PJ, semi-desert shrubland, sagebrush (barren Mancos shale outcrops); Grayish, argillaceous shale outcrops, tends to be dominant plant in openings between low shrubs of *Artemisia, Chrysopsis,* and *Tetraneuris*.
Cushion bladderpod (*Physaria pulvinata*)	PJ, semi-desert shrubland, sagebrush (barren shale outcrops); Grayish, argillaceous shale outcrops, tends to be dominant plant in openings between low shrubs of *Artemisia, Chrysopsis,* and *Tetraneuris*.
Largeflower triteleia (*Triteleia grandiflora*)	Grasslands or sagebrush and pinyon-juniper woodlands to Ponderosa pine-forest slopes and hills, 4500'-7500' in UT.

3.5.2 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

Since this alternative would not permit livestock grazing, no impact from livestock would occur to endangered or sensitive plants known or suspected to occur within the project area. Those that are present and are typically impacted from livestock would benefit from this alternative by a reduction of consumption and trampling. These impacts may continue, however to a much less degree, from wildlife.

Knowlton's cactus (Pediocactus knowltonii)

Habitat of the Knowlton's cactus is pinyon- juniper (Pinus edulis-Juniperus scopulorum) woodlands and sagebrush (Artemisia spp.) shrublands with loamy, gravelly alluvial soils. In some areas the substrate is covered in cobbles. The cactus may grow in the open or in the shade of larger plants. It has been associated with disturbed areas such as roadsides but particularly on gravelly red-brown clay soils derived from tertiary alluvial deposits.

This plant is only confirmed to exist in one New Mexico county where there is a single population on a patch of territory measuring about 12 acres. The cactus occurs on land very close to the Colorado border; in fact, it has been observed within 100 feet of the state line.

The largest primary threat to the Knowlton's cactus is residential development. Other threats include off-road vehicle use, oil and gas development, livestock grazing, drought, and small rodents feeding on the flowers. Livestock on the Glade landscape spend very little time in habitat that supports this species and do not readily forage on cactus. The lack of palatable species in association with Knowlton's cactus promotes livestock use elsewhere. The biggest threat from livestock is perhaps trampling should they travel through appropriate habitat getting to other areas where forage is more readily available.

Pagosa Skyrocket (Ipomopsis polyantha)

The Pagosa skyrocket is a herbaceous biennial plant in the phlox family occurring on rocky clay soils of Mancos shale soils. Typically it is found on road shoulders where the soil has been disturbed. Highest densities are under Pinus ponderosa forests with montane grassland understory at 6,765 - 7,362 feet elevation.

Pagosa skyrocket is only found in two populations in and near the town of Pagosa Springs at an elevation of 6,800 to 7,300 ft. The plant can be found on gray soils derived from Mancos shale in open grasslands and grassland understories at the edges of open forests. The species has adapted to grow on these shale soils, which are very dry and erosive, making the conditions harsh and difficult for most other plant species to survive. Due to development impacts, remaining Pagosa skyrocket habitat is often found adjacent to roads, in dry ditches, among buildings, and in some pastures. The primary threat to Pagosa skyrocket is land use changes including commercial, residential, municipal, and agricultural property development, and associated utility installations and access roads. In addition, nonnative invasive plants (weeds), concentrated livestock use, and the potential effects of climate change may impact the species.

The entire global range of Pagosa skyrocket is planned for residential development in the Archuleta County Community Plan. Given the serious nature of the threats to Pagosa skyrocket, it is among the most endangered species in Colorado. The current and potential conversions of agricultural lands to residential and commercial development are incompatible with conservation of Pagosa skyrocket in the long term because they cause direct mortality and permanent loss of habitat.

Habitat modified by grazing may be recovered by changes in management. Over-the-fence observations from seven locations (pastures) in 2009 found few or no plants in three heavily grazed pastures and numerous plants in adjacent pastures with light or no grazing (USFWS 2010). Given the objectives of this project to reduce impacts from livestock grazing where utilization criteria are not being met and range health is not resilient, the Glade Rangeland Management Project would likely have a positive effect on Pagosa skyrocket, should it occur-which is very unlikely, within the project area.

Stream Orchid (Epipactis gigantean)

Stream orchid is a species of orchid also called giant helleborine. It is a perennial that can grow up to 3 feet in height. It is found in wet areas including riverbanks, hot springs, and meadows.

The global distribution of Stream orchid extends from southern British Columbia through the western United States, reaching inland as far as Texas, with one collection from central Mexico. Throughout its wide range, it occurs infrequently but can be locally abundant.

Observations of known occurrences suggest several potential threats to Stream orchid. In order of greatest to least concern, these threats include recreation, exotic species invasion, water development, domestic livestock grazing, urban development, timber harvest, and utility line construction/maintenance (USDA 2006). Maintaining an intact hydrologic regime is the most significant conservation element for Stream orchid. Other conservation elements should address exotic species invasion, habitat loss, disturbance intensity, and altered nutrient cycles.

Cattle tend to congregate in riparian and wetland areas, especially in arid regions, to take advantage of the water, shade, and food resources these areas offer. Grazing can directly impact Stream orchid individuals through trampling or consumption. In Region 2, only two occurrences mentioned observation of grazing of E. gigantea individuals by domestic livestock. These observations suggest that E. gigantea is occasionally eaten by domestic livestock, but it is not known whether it is a preferred forage species.

While little is known about the direct effects of livestock herbivory on Stream orchid, riparian and wetland habitats can degrade because of improper domestic livestock grazing. The intensity, location, duration, and frequency of grazing determine the degree of impact. Poorly managed livestock use of wetlands can incise and lower the water table, alter channel morphology, impair plant regeneration, introduce non-native species, shift community structure and composition, degrade water quality, and diminish general riparian and wetland functions. On the other hand, properly managed grazing resulting in healthy wetland habitat may not pose any threats to E. gigantea occurrences.

Depending on grazing practices and local environmental conditions, impacts can range from reversible (slight shifts in species composition) to severe and irreversible (extensive gullying, introduction of non-native plant species). Management practices such as fencing off riparian areas, rest-rotation, or winter grazing may improve the health of the riparian ecosystem by allowing the vegetation to re-grow (USDA 2006).

Given there are no active objectives of this alternative to reduce impacts from livestock grazing; particularly in seeps, springs and streams where utilization criteria are not being met and range

health is not resilient; this alternative would likely have a negative effect on Stream orchid, should it occur within the project area.

Lone Mesa Snakeweed (Gutierrezia elegans)

Broom snakeweed is a bushy, short-lived, native, perennial shrub or subshrub that grows from 8 to 28 inches in height. Since little is known about this particular species of snakeweed, we can glean from information on a close relative that is common in this area, broom snakeweed (Gutierrezia sarothrae).

Lone Mesa Snakeweed has only been recorded from the Lone Mesa State Park, near the Glade landscape.

Broom snakeweed provides little to no browse for domestic livestock (USDA 2015). Broom snakeweed can be toxic to domestic sheep, goats, and cattle particularly during winter or early spring when poor forage availability forces animals to consume large quantities. Broom snakeweed is rated poor in energy and protein value for cattle in Colorado, Montana, North Dakota, Utah and Wyoming.

Increases in broom snakeweed may be due to livestock grazing since cattle choose competing forage plants, allowing snakeweed to increase. Broom snakeweed quickly invades overgrazed rangeland. Cattle sometimes leave broom snakeweed almost untouched while moderately to heavily grazing grasses. An abundance of this shrub is considered by some authorities as an indicator of range deterioration (USDA 2015).

Livestock on the Glade landscape spend very little time in habitat that supports this species. Livestock are not likely to forage on snakeweed given its low palatability and the presence of more preferred plants. The lack of palatable species in association with Lone Mesa snakeweed promotes livestock use elsewhere. The biggest threat from livestock is perhaps trampling should they travel through appropriate habitat getting to other areas where forage is more readily available.

Cushion Bladderpod (Physaria pulvinata)

Cushion bladderpod is a low, compact, densely matted, deep-seated taproot, long-lived perennial plant of the Mustard family. It is on widely scattered outcrops of grayish, argillaceous Mancos shale soils. It grows in montane openings between low shrubs.

This species is endemic to Colorado, confined to shale soil outcrops that are widely used for road gravel. It has been found in Lone Mesa State Park, near the Glade landscape.

Threats to Cushion bladderpod include improper livestock management, intense recreational use, mining of shale substrate for road construction, and off-road vehicle use. Little is known about this particular species of bladderpod, but gleaning from what is known about other bladderpods, impacts from cattle feeding on them are unlikely. Livestock on the Glade landscape spend very little time in habitat that supports this species. The lack of palatable species in association with Cushion bladderpod promotes livestock use elsewhere. Trampling and soil compaction are perhaps the greater threat from livestock as they travel through appropriate habitat getting to other areas where forage is more readily available.

Largeflower triteleia (Triteleia grandiflora):

Largeflower triteleia is a perennial plant in the lily family that has been reported from Washington, Oregon, northern California, Idaho, Wyoming, Utah, and southwest Colorado. L

Largeflower triteleia is ranked globally 'apparently secure to secure' (G4/G5) by NatureServe and critically imperiled (S1) in Colorado. Activities on the SJNF with the most potential to impact largeflower triteleia include livestock grazing, recreation, oil and gas development, fire management, timber harvest, and mechanical fuels treatments.

Desired conditions for largeflower triteleia are based on existing conditions at the location of the known occurrence on the Dolores District, which is thriving. Conditions include: a ponderosa pine/Gambel's oak stand with approximately: 30% tree cover, 30% shrub cover, 30-40% forb cover, 15-25% graminoid cover, and 10-20% bare ground. The herbaceous understory is relatively diverse and healthy, including several species of perennial forbs and bunchgrasses. Gambel's oak is multi-aged with a majority of the clumps being mature oak. No noxious weed infestations are present. Light surface fires burn through the stand occasionally.

The only known location of this species on NFS lands in USFS Region 2 is on the Dolores Ranger District on the SJNF. At this site, it is found in open to partially shaded patches in a ponderosa pine/Gambel's oak community at approximately 7,900 to 7,960 feet in elevation (Ladyman 2007). The individual plants are typically in association with the tree-form of Gambel's oak.

According to the Conservation Assessment (Ladyman 2007) for the species, invasive species, soil compaction and soil disturbance are listed as major threats to largeflower triteleia. It also lists human recreation, livestock grazing, and resource development (timber and mineral) as threats to largeflower triteleia. Specific to livestock grazing, the Conservation Assessment states, "Livestock, especially sheep, use the aerial parts of the plant, and when conditions permit, they will pull up the corms and eat them as well. The effects of historic and current livestock grazing on T.grandiflora occurrences are unknown" (Ladyman 2007 Pg. 4). "Since the flowers and fruits of T.grandiflora are borne on the top of a tall stem, they are vulnerable to browsing and grazing animals, and mid- to late-season herbivory has the potential to reduce seed production" (Ladyman 2007 Pg. 81).

The only place this species has been located on the Forest is on the Dolores District and specifically in the Boggy Draw area. Despite extensive surveys, the only record of largeflower triteleia is from one specific location in the Boggy Draw area. Similar habitat does exist within the Glade Analysis area and therefore, the species may exist within the project area, although highly unlikely.

Under the current situation (Alternative B), no permitted sheep grazing is planned and therefore, the potential for grazing impacts would be expected to be low. However, cattle trampling effects could occur within suitable habitat.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Given stronger allowable use design criteria, reduced or more restrict use adaptive management, better rotations and other management proposed under this alternative, soil and plant resources should improve and potential impacts from livestock grazing on any or all sensitive plant species would likely be reduced. Given the objectives of this project to reduce

impacts from livestock grazing; particularly in seeps, springs and streams where utilization criteria are not being met and range health is not resilient; Alternative C would likely have a positive effect on Stream orchid, should it occur within the project area.

3.6 Wildlife & Fish

3.6.1 Affected Environment and Environmental Consequences

Threatened, Endangered, Proposed, and Candidate Species

The San Juan National Forest consults with the USFWS on a quarterly basis: the latest consultation was done on August 11, 2014 (San Juan Public Lands 2014). The USFWS list of terrestrial species includes 3 mammal species, 4 avian species, and 1 invertebrate as threatened, endangered, proposed, or candidate species with potential to occur on the SJNF. All of these were eliminated from further discussion due to a lack of habitat in the project area. Species distribution and habitat potential is based on cited literature, and field visits to the Project Area (May 7 and 14; June 8, 9, and 10; June 15 and 16; and August 3 and 4, 2014).

Sensitive Species

A list was developed that included sensitive species, or their habitats that are located on the Dolores Ranger District of the San Juan National Forest, or are located adjacent to or downstream of the project and could potentially be affected. A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance is needed to complete the analysis. Sources of information included Forest Service records and files, the State Natural Heritage Program database, state wildlife agency information, and published research (citations). No further analysis is needed for species that are not known or suspected to occur in the project area, for which no suitable habitat is present and that livestock grazing has no effect to habitat (i.e., snags). Species carried forward in the analysis are identified in the Table 3.4.

Table 3.4 Sensitive wildlife species with potential to occur in the project area

SPECIES	STATUS	KNOWN OR EXPECTED PRESENT*	SUITABLE HABITAT PRESENT	CARRIED FORWARD IN THE ANAYLIS (YES/NO)	RATIONALE
Birds					
Lewis' woodpecker	Sensitive	S	yes	yes	Occupy open pine forests, burned over areas with standing snags and stumps.
Northern goshawk	Sensitive	S	yes	yes	Habitat is located within the analysis area. Known historic territories exist with the project area
Amphibians					
Northern leopard frog	Sensitive	S	yes	yes	The analysis area contains aquatic features associated with this species

***Presence Determinations** are: habitat not present (NP); habitat present species not expected to occur (NS); suspected occurrence (S); known occurrence (K).*

Northern Goshawk

Background: The Northern goshawk (goshawk) is a forest generalist because it occurs in all major forest types (coniferous, deciduous, and mixed). Mature forest structures appear to be an important component in the goshawks nesting home range. It was noted, however, that the goshawk seldom uses young dense forests. They suggested that the reasons for avoidance of these areas may be due to insufficient space in and below the canopy to facilitate flight and prey capture. Additionally, due to the absence of larger trees, these areas would offer few opportunities for nesting.

Goshawks exhibit high breeding territory fidelity from year to year. The nesting home range is occupied by the goshawk pair from early March at least until late September. Reynolds et al. (1992) identified three components of nesting home range: nest area, post fledging-family area (PFA), and foraging area. The nest area, which averages 20-25 acres, is contained within the PFA. The PFA, an area of concentrated use around the nest site, averages roughly 415 acres in size (not including nest area) (Kennedy, 1989, 1990). These two areas of activity lie within the foraging area, which comprises, on average, between 5,000 and 6,000 acres (Reynolds et al. 1992).

Affected Environment: A territory of a breeding pair of goshawks consists of nesting, post-fledgling family (PFF), and foraging areas. Recommended sizes for these areas are 30, 420, and 5,400 acres, respectively (Reynolds et al. 1992). It prefers habitat during the breeding season that includes mature deciduous, coniferous, and mixed forests where goshawks can maneuver in and below the canopy while foraging, and where they can find large trees in which to nest (Reynolds 1989). The nest-stand size is defined by a contiguous area that contains a high canopy closure (> 50%), large over story (basal area 90-110 square feet [Shuster 1980]), and open understory. The nesting area of goshawks territories has more specific requirements for vegetation structure than the PFF or foraging areas; foraging areas and PFF are characterized by more variability in the vegetation structure (Reynolds et. al. 1992). As a result, forest stands that have nesting characteristics are less common and should be protected when possible.

The analysis area for this project contains significant acres of potentially suitable nesting habitat for this species. There are known territories of goshawks within the Mair, Glade, Brumley, Long Park, and Salter allotments. These territories contain active primary and secondary goshawk nests, which are monitored every year. Overall the analysis area contains good nesting and foraging habitat based on annual inventories that are conducted across the glade landscape.

Direct and Indirect Effects of Alternative A: No Permitted Livestock Grazing

For the goshawk, the ponderosa pine/Gambel's oak and aspen forests provide primary nesting (forests) and foraging (forest floor vegetation supports prey species) habitat on the landscape of the analysis area. The description below describes the effects of alternatives on habitats within the ponderosa pine/Gambel's oak, and aspen forests and serves at the background for effects determinations.

The overstory of mature ponderosa pine, Gambel's Oak and aspen trees are not affected by livestock grazing. This component of sensitive species habitat is not affected under any alternative. Regeneration of ponderosa pine seedlings on the Glade landscape was not raised

as an issue. Actions have been taken in the past and would be taken in the future to protect pine seedling plantations as the need is determined on a site-specific basis. Natural pine regeneration in openings has occurred under current livestock grazing management. Aspen makes up a small percentage of the forested landscape within this analysis area. Actions have been taken in the past and would be taken in the future to protect aspen seedlings after mechanical harvest or in response to wildfires or wind throw events as determined to be needed on a site-specific basis. Gambel's oak regeneration is successful across the landscape under current grazing. The effect of livestock grazing on fire dynamics may have occurred historically, but recent livestock grazing has been managed to maintain residual litter and plant cover that supports the fire cycle. Alternative A would eliminate any affect to regeneration from livestock use, unless perhaps a large build-up of fuels occurs from a lack of grazing and increases fire spread.

Direct and Indirect Effects of Alternative B: Current Permitted Grazing and Management

See description above under Alternative A. It can be concluded no changes to forest structure or composition are anticipated as a result of livestock grazing under Alternative B.

The understory grass and forbs within the ponderosa pine/Gambel's oak and aspen stands are affected by livestock grazing under Alternatives B. Livestock eat grasses and forbs thus removing or reducing them as cover for small mammals. Under Alternative B, livestock have not been distributed across the pine/oak and aspen stands so that some areas have not been affected. This would likely continue if Alternative B is selected. Alternative B sets a maximum use of 45% within the growing season (for rotation grazing systems). This maximum use limit results in adequate residual plant material for other wildlife species to use as food and cover. Given that only a portion of any specific allotment is suitable for livestock use and only portions of the suitable range are actually grazed by livestock to any significant extent (e.g. approaching allowable use), evaluation of landscape level effects show that most of the habitat is minimally affected and is therefore maintained in near natural conditions. Even if every acre of the pine/oak and aspen stands were evenly grazed, the rangeland health and diversity of grasses and forbs would be maintained (see range section of this DEIS). Alternative B is expected to maintain grass/forb habitat in the understory of pine/oak and aspen stands. Therefore, although effects are present, habitat is maintained for species dependent on grasses and forbs within the pine/oak and aspen habitats.

Direct and Indirect Effects of Alternative C: Proposed Action with Adaptive Management

See description above under Alternative A. It can be concluded no changes to forest structure or composition are anticipated as a result of livestock grazing under Alternative C.

The understory grass and forbs within the ponderosa pine/Gambel's oak and aspen stands are affected by livestock grazing under Alternatives C. Grass clumps and forbs serve as cover for small mammals (goshawk prey species). Under Alternative C distribution should be improved so that livestock grazing occurs in a more even pattern across these stands. Alternative C sets a maximum use of 45% within the growing season (for rotation grazing systems). This maximum use limit results in adequate residual plant material for other wildlife species to use as food and cover. Even if every acre of the pine/oak and aspen stands were evenly grazed, the rangeland health and diversity of grasses and forbs would be maintained (see range section

of this DEIS). Alternatives C is expected to maintain grass/forb habitat in the understory of pine/oak and aspen stands. Therefore, although effects are present, habitat is maintained for species dependent on grasses and forbs within the pine/oak and aspen habitats.

Determination of Effect and Rationale for Northern Goshawk

With implementation and monitoring of Forest Plan standards and guidelines and riparian/ wildlife project design criteria, and improvement in habitat conditions including the ponderosa pine, it is determined that grazing by domestic livestock may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide. "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"- this determination is based on the findings that effects in the project area are not expected to be significant, and the species and its habitat would remain well distributed.

Lewis' Woodpecker

Background: Three principal habitats for Lewis' woodpecker are open ponderosa pine forest, open riparian woodland dominated by cottonwood, and logged or burned pine forest; however breeding birds are also found in oak woodland, nut and fruit orchards, pinyon pine-juniper woodland, a variety of pine and fir forests, and agricultural areas including farm and ranchland. Important aspects of breeding habitat include an open canopy, a brushy understory offering ground cover and abundant insects, dead or downed woody material, available perches, and abundant insects (Cornell 2015).

The Lewis' Woodpecker is of high conservation importance, because of its relatively small and patchy distribution, low overall density, and association with mature montane and riparian forests. This species is poorly monitored in many parts of its range, but exhibits a significant long-term decline overall. Populations may have declined by as much as 50 % since 1966. Associations with various forest types, sensitivity to fragmentation and silvicultural practices are poorly known and would be important to understand for sustaining healthy populations.

Affected Environment: The Lewis' Woodpecker is a relatively abundant and widespread breeding bird across the analysis area in both pine uplands and lowland riparian corridors, and is a relatively common permanent resident of lower elevation riparian zones on the Dolores Ranger District. In the analysis area, potential habitat for the Lewis's woodpecker exists throughout all the allotments. Springs associated with the analysis area also provide foraging habitat for the Lewis's woodpecker.

The majority of Lewis's woodpecker habitat (open ponderosa pine, mountain shrub land, and riparian areas) in the analysis area is within suitable grazing habitat. Currently, the Gambel's oak layer and grasses are not in optimal condition due to fire suppression and minimally to grazing. Riparian areas, such as springs and streams in open meadows, are not in a healthy condition, but likely continue to provide insect populations for a food source.

Direct and Indirect Effects for Alternative A: No Permitted Livestock Grazing

For Lewis' woodpecker, the ponderosa pine/Gambel's oak and aspen forests along with riparian areas provide primary habitat on the landscape of the analysis area. The description below

describes the effects of alternatives on habitats within the ponderosa pine/Gambel's oak and aspen forests and serves at the background for effects determinations.

The overstory of mature ponderosa pine, Gambel's oak and aspen trees is not affected by livestock grazing. This component of sensitive species habitat is not affected under any alternative. Regeneration of ponderosa pine seedlings on the Glade landscape was not raised as an issue. Actions have been taken in the past and would be taken in the future to protect pine seedling plantations as determined to be needed. Natural pine regeneration in openings has occurred under current livestock grazing management. Aspen makes up a small percentage of the forested landscape within this analysis area. Actions have been taken in the past and would be taken in the future to protect aspen seedlings after mechanical harvest or in response to wildfires or wind throw events. Gambel's oak regeneration is successful across the landscape under current grazing. The effect of livestock grazing on fire dynamics may have occurred historically, but recent livestock grazing has been managed to maintain residual litter and plant cover that supports the fire cycle. Alternative A would eliminate any affect to regeneration from livestock use, unless perhaps a large build-up of fuels occurs from a lack of grazing and increases fire spread.

Under Alternative A, riparian-wetland areas would be maintained at or move towards proper functioning condition and riparian-wetland ecosystem conditions would improve. With the exception of Hunt Creek, Ryman Creek, and the Dolores River, stream health conditions would be maintained at or move towards robust stream health with the extent of stable banks approaching reference conditions. Alternative A would move specific riparian habitats previously described towards desired conditions. Improvements to riparian-wetland function, ecosystem condition, and stream health would occur gradually for intermittent and ephemeral systems (on the order of decades) and more quickly for perennial systems (on the order of years).

Direct and Indirect Effects of Alternative B: Current Permitted Grazing and Management

See habitat description under Alternative A. It can be concluded no changes to forest structure or composition are anticipated as a result of livestock grazing under either Alternative B.

Under Alternative B, most of the riparian-wetland areas would continue to function as currently rated under Proper Functioning Condition protocol, maintaining their current trends. Riparian-wetland ecosystem conditions that are improving under current management would continue to improve. Riparian-wetland ecosystem conditions that are deteriorating under current management would continue to deteriorate and to potentially move down a condition class (e.g., a riparian-wetland areas that is Functional-At Risk with a downward trend has the potential to become Nonfunctional). Stream health conditions would remain unchanged from current conditions for most of the streams in the analysis area, with the possibility of some streams that were rated "At-risk" becoming "Diminished." The effects to specific riparian habitats when moving away from desired conditions are described in Tables 5 through 11 of the Hydrology Report. Improvements to riparian-wetland function, ecosystem condition, and stream health, where they are currently occurring, would take longer than under the no grazing alternative.

Direct and Indirect Effects of Alternative C: Proposed Action with Adaptive Management

See habitat description under Alternative A. It can be concluded no changes to forest structure or composition are anticipated as a result of livestock grazing under either Alternative C.

Under Alternative C, riparian-wetland areas would improve. Alternative C would identify these areas and apply management options that allow for more rapid adjustment of grazing plans if initial corrective measures did not improve conditions as expected. Riparian-wetland areas would be maintained at or move towards proper functioning condition and riparian-wetland ecosystem conditions would improve. With the exception of Hunt Creek, Ryman Creek, and the Dolores River, stream health conditions would be maintained at or move towards robust stream health with the extent of stable banks approaching reference conditions. Alternative C would move specific riparian habitats towards desired conditions.

Improvements to riparian-wetland function, ecosystem condition, and stream health would occur at a slower rate than under the no grazing alternative but at a faster rate than the current grazing alternative; however, recovery for intermittent and ephemeral systems would still be on the order of decades and recovery for perennial systems would still be on the order of years.

Determination of Effect and Rationale for Lewis' Woodpecker

With implementation and monitoring of Forest Plan standards and guidelines and riparian/ wildlife project design criteria, and improvement in habitat conditions including the ponderosa pine and riparian vegetation types, it is determined that grazing by domestic livestock may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide. "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" – this determination is based on findings that effects in the project area are not expected to be significant, and the species and its habitat would remain well distributed.

Northern Leopard Frog

Background: The habitats used by the Northern leopard frog (NLF) are varied across its range. In Colorado it is reported to range in occurrence from below 3,500 feet in northeastern Colorado to above 11,000 feet in southern Colorado. There are three major NLF habitat divisions: winter habitat (lakes, streams and ponds), summer habitat (post-breeding areas including upland habitats for feeding), and egg/tadpole habitat (shallow breeding ponds). Although aqueous habitats are a central feature in the frog's cycles of life, it may range a considerable distance from natal and breeding areas to a variety of other habitat types. Typical aqueous features used by the NLF include wet meadows and the banks and shallows of marshes, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams and irrigation ditches. Streams are often used as dispersal corridors, but upland areas are also used.

Suitable breeding habitat for the NLF on the Forest would be found in streams, natural lakes and ponds, glacial kettles, stock ponds and reservoirs, marshes and wetlands. Post-breeding habitat would be found along the edges of these features as well as the surrounding upland habitats (generally within 2 miles). Wintering habitat would be found in streams, ponds, and

lakes that do not completely freeze during winter and do not have substantial populations of predaceous fish.

Larvae of the NLF are primarily vegetarian gaining sustenance by filtering free-floating algae from their surrounding waters. However, they have been observed feeding on dead animal material including conspecifics. Adults and sub-adults are carnivorous and primarily insectivorous, although they have been described as generalists that will "consume anything that moves and is small enough to swallow." Beetles and grasshoppers may make up a large portion of their diets. Other common prey includes flies, wasps and bees, and spiders. Studies on stomach contents have also found mollusk, crustaceans, garter snakes, hummingbirds and a yellow warbler.

Loss or degradation of breeding habitat can occur through changes in hydrology or water quality. Other factors include habitat fragmentation, predation, disease, sensitivity to UV radiation, and recruitment into the population.

Affected Environment: Habitats for this species include the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, and other bodies of permanent water, including wet meadows throughout the analysis area. Rooted aquatic vegetation is an important habitat component. Habitat surveys and general ocular surveys on some areas of habitat were conducted during 2007, with no sightings within the analysis area. A negative finding in one summer does not assume non-occupancy. Habitat is present. Presence of habitat assumes occupancy. Habitat in the form of stock ponds, streams, and possibly springs provides habitat for the northern leopard frog in the analysis area. The analysis area has a wide variety of aquatic habitat that has the potential to provide habitat for the NLF.

Direct and Indirect Effects of Alternative A: No Permitted Livestock Grazing

Alternative A would have no detrimental impacts to NLF, because livestock grazing would not occur. Seeps, wet areas, streams and springs would not be trampled by livestock, and habitats would improve under this alternative (impacts from wild ungulates may continue). There may be an increase in NLF individuals as a result of increased suitable habitat.

Direct and Indirect Effects of Alternative B: Current Permitted Grazing and Management

Alternative B would have the most impact on riparian areas. Degradation of the habitat could eliminate use of the habitat, change plant species' composition and affect riparian sensitive species' ability to reproduce and survive.

Under Alternative B, cattle would remain poorly distributed in the pastures and potentially for a longer amount of time than under Alternative C, and therefore concentrated at the riparian areas for a longer amount of time, lessening the ability of the riparian areas to move towards desired habitat conditions for riparian species. This has been the situation for some time and some improvement in riparian/wetland health has been documented (see range vegetation section), although improvement is likely insufficient for the NLF in some areas.

Direct and Indirect Effects of Alternative C: Proposed Action with Adaptive Management

Alternative C would have some beneficial effects to amphibian habitat. By reducing utilization in wetland and riparian areas through stubble height restrictions and other proposed actions,

there would be less degradation of these key areas of amphibian habitat. Habitat would likely improve under this alternative. There would be an increase in the habitat quality such as cover and reduced sediments, which affect amphibian survival. Impacts of grazing to riparian areas would improve for all riparian dependent sensitive species compared to Alternative B.

Reducing utilization and stocking levels, and utilizing the adaptive management tools under this alternative would potentially speed recovery and reduce impact to aquatic habitats.

Determination of Effect and Rationale for Northern Leopard Frog

With implementation and monitoring of Forest Plan standards and guidelines and riparian/ wildlife project design criteria, and improvement in habitat conditions, it is determined that grazing by domestic livestock may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" – this determination is based on findings that effects in the project area are not expected to be significant, and the species and its habitat would remain well distributed.

Management Indicator Species (MIS)

Each National Forest is managed under a Land and Resource Management Plan (LRMP) that establishes overall management direction, including that intended to maintain healthy populations of fish and terrestrial wildlife species. Due to the large number of species that occupy Forest Service Lands, a subset of species are identified for analysis purposes that are intended to represent the full range of species. This subset is collectively referred to as Management Indicator Species (MIS).

This analysis is based on the best available science as evidenced by its use of the most recent Forest-wide habitat and individual MIS assessments, expert professional opinions, and site specific field analysis of the project area. The individual Forest-wide species assessments explain the reasons for MIS selection in the Forest Plan, and contain information on the species life history, conservation status, distribution, abundance of the Forest and each Ranger District, population and habitat trends, limiting and/or controlling factors, influential activities and risks, and monitoring.

This analysis conforms to direction found in the "governing plan" in the current MIS analysis requirements in the San Juan National Forest Land and Resource Management Plan. In general the analysis uses wildlife habitat as the primary indicator of MIS trends, which may be supplemented by the population data where it is available and where it adds to value to the analysis. The Forest Plan lists a variety of acceptable analysis data sources for monitoring population and habitat trends of MIS, such as population estimates by State Wildlife agencies, professional judgment of FS wildlife biologists, habitat inventory assessments, resource information systems, and activity/program reviews. All MIS identified in the Forest Plan and reasons for their selection are considered during initial project screening. A detailed analysis is then conducted on those species that may be affected. The analysis then concludes how the Proposed Action would affect Forest-wide habitat and population trends.

The following analyses are tiered to and reference the San Juan National Forest's MIS Assessments 2005. They are available at the Dolores Public Lands Office.

Some species are present in the analysis area, but the project proposal and its effects are not believed to be a limiting factor for the habitats they represent as MIS species. Refer to the MIS Assessments in the project files for information on population and habitat trends. None of the alternatives would affect or change the habitat or population trend at the project or Forest level. Those species are: Abert's squirrel, hairy woodpecker, brook trout, brown trout, Colorado cutthroat trout, and rainbow trout.

The Abert's squirrel relies on mature and late successional ponderosa pine. Livestock grazing does not remove or impact mature and late successional ponderosa pine, especially in the dense canopies which Abert's squirrels prefer. The hairy woodpecker is an indicator of changes in snag and mature trees. Livestock grazing does not affect these habitat components. Habitat for the fish species listed above is only located in the lower Dolores River. Since there are no direct affects to the Dolores River from the alternatives, livestock grazing would have no effect on these fish species. Therefore, there would be no effect or change to habitat or population trend for Abert's squirrel, hairy woodpecker or indicator fish as a result of this project.

Elk

Background: Elk are identified in the Forest Plan as an early successional management indicator species (MIS) 1992, and the Colorado Division of wildlife manages elk as a big game species. Elk have three broad habitat requirements 1) feeding 2) cover and 3) rearing (Towry 1987). All three of these habitat requirements exist on the San Juan National Forest. Feeding and cover requirements are important year-round on summer and winter range. Rearing requirements are important during a brief period in the spring on summer range.

Elk habitat condition and capability varies within each Data Analysis Unit (DAU). A DAU is a large discrete analysis unit that the Colorado Parks and Wildlife (CPW) uses to monitor elk populations. Topography, elevation, weather, livestock grazing, travel management, soil types, and plant communities are the main factors influencing habitat condition and capability. Elk are migratory, moving between winter and summer range throughout the year. Winter range is the most critical for elk, mainly influenced by weather, forage and animal body condition. Summer range can be critical if there is a very dry summer thus a decrease in forage amount and condition (USDA 2004).

Affected Environment: The majority of the analysis area consists of elk forage. Cover includes those areas of the Forest with a denser canopy cover and as a result often a denser forest. Forage on the analysis area includes areas that cattle are more likely to graze, such as shrublands, grass parks, and open mature stands of trees. Some cover habitats provide forage; while some forage stands provide cover due to the undergrowth (mature open aspen stands). The GIS analysis to determine acres of cover and forage places stands into one of two categories, either forage or cover, and due to this lumping does not recognize that many of the stands, ie; mature oak and open, mature ponderosa pine and aspen stands, provide both elements on the ground. The total amount of combined elk habitat in the analysis area is nearly 98%. A majority of these acres are also suitable for cattle grazing.

The analysis area also contains big game winter range in portions of Brumley, Mair, Glade, Long Park, Salter, and Sagehen allotments. Winter range is important as it provides critical nutrition during the months where elk are carrying young. Winter range is utilized by elk primarily during December through April.

Monitoring of elk populations include both harvest and census data to estimate population size from year to year. Colorado Parks and Wildlife (CPW) will continue monitoring elk populations across the Forest. Colorado has the largest elk herd in the United States. In 1994, there was a shift in management objectives to reduce numbers. The Forest continues to have a large elk population, but herds are not as large as approximately 10 years ago. From 1983 to 2002, it was found that changes in habitat on the Forest do not appear to affect elk numbers. In addition, cattle grazing tend to redistribute the use of certain habitats by elk (SJNF MIS Assessment 2005h).

CPW monitors elk populations in each DAU. There are three DAU's on the Forest. The Glade analysis area falls into DAU-E24 (E24) and includes areas outside of the Forest boundary. The DAU-E24 for the Disappointment elk herd is located in southwest Colorado, and includes the Dolores River basin and part of the San Miguel and San Juan River basins. It consists of Game Management Units 70, 71, 711, 72, and 73. It has an area of 5,055 square miles and encompasses portions of Dolores, Montezuma, Montrose, and San Miguel Counties. The DAU is bound on the north by the Dolores and San Miguel Rivers; State Highways 90 and 62; on the east by the Ouray/San Miguel, San Juan/San Miguel, Dolores/San Juan, Montezuma/La Plata county lines; on the south by New Mexico; and on the west by Utah (CPW DAU E24 Plan 2006). Current population objectives set forth in the DAU-E24 Disappointment Elk Management Plan are for a population of 16,000-18,000 elk (CPW DAU E24 Plan 2006). CPW estimates current population numbers as of 2014 to be 19, 200 elk (CPW Post Hunt Model, 2014).

Today, two of the largest influences on management of deer and elk are human population growth and land development. Both of these can and do, influence the way the State manages these big game populations. The most influence from land development can be seen on winter range and transitional range. The human population is expanding every year, which also places a greater demand for hunting licenses and recreational activities, which in turn can influence big game population objectives (USDA 2004). San Juan National Forest Service winter range is heavily interspersed with private land, where development is established and increasing (SJNF 2005h).

Direct and Indirect Effects of Alternative A: No Permitted Livestock Grazing

Alternative A would be the most desirable alternative for elk, at least in the short term, since there would be no reduction in the amount or quality of forage due to cattle grazing. Bunch grasses and diverse and vigorous shrubs would exist, improving forage areas. Within the analysis area, habitat would be in an upward short-term trend. Elk would not be redistributed due to cattle presence and competition for forage (SJNF MIS Assessment 2005h). In the long-term , however, forage plants may become stagnate and decadent given a lack of use and build-up of dead litter. In this case, elk could be negatively affected given a loss in quality and vigor of forage.

Direct and Indirect Effects of Alternative B: Current Permitted Grazing and Management

Under Alternative B, elk habitat that is in poor condition would remain in poor condition. Forage habitat in parklands and meadows would not be quality habitat given continued heavy use by livestock. In addition, elk tend to avoid cattle and areas used by cattle. Currently during the late grazing season, based on field reconnaissance and input from the CPW terrestrial biologist, elk are abandoning areas grazed by cattle (such as the aspen), and are likely being temporarily redistributed to private land where cattle have not grazed. The concept of the FS maintaining elk on public lands longer to reduce effects to private land is not being met. Elk may have fewer acres of winter range to graze. The existing condition would most likely not cause a change in the elk population, as no correlation has been found between the trend in elk population and the trend in habitat However, the winter range is a small but important and limiting factor for elk management (SJNF MIS Assessment 2005h.) and is likely to become more so in the future with additional urban development.

Direct and Indirect Effects of Alternative C: Proposed Action with Adaptive Management

Alternative C would be the best permitted livestock grazing alternative when considering elk habitat. Under Alternative C, elk habitat is expected to improve and forage habitat is expected to move towards a satisfactory condition, particularly in parklands and meadows. In those areas where allowable use criteria have not been traditionally met, utilization of forage by cattle would decrease, and stubble height would increase, providing more shrubs and grass volume for elk to forage. The allotments would meet or trend towards a more diverse shrub community with taller bunch grasses as part of the shrub ecosystem. Riparian areas would likely provide more riparian vegetation for forage. It is anticipated that with the design criteria and/or adaptive management, elk may be more likely to remain in the winter range, and redistribution of elk to private lands may decrease. The big game winter range would improve because pastures would be managed based utilization, therefore leaving available and higher quality forage for elk during the critical winter period.

Determination of Effect and Rationale on Elk

Under all alternatives, it is expected that cattle grazing would not change elk population numbers as they are constrained more by winter habitat rather than summer range (where permitted livestock graze on the project area), and therefore the population objective would continue to be met or exceeded. Analysis of cover and forage attributes found that changes in habitat on the Forest do not appear to affect elk numbers in the project area.

Therefore, the proposed project (Alternative C), with implementation and monitoring of Forest Plan standards and guidelines, riparian/ wildlife project design criteria, and improvement in habitat conditions, it is determined that grazing by domestic livestock may impact individuals, but is not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability range-wide. "May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" – this determination is based on findings that effects in the project area are not expected to be significant, and the species and its habitat would remain well distributed.

3.7 Socio-Economics

3.7.1 Affected Environment

Demographics

Dolores County includes the population center and county seat, Dove Creek. The County has about 1,700 residents (2013), the 58th (of 64) most populated county in Colorado. The County had a population decrease of 7.3 percent between 2000 and 2013, which differed from the state's percent of population growth of 19 percent, and lower than the nation's 10 percent population change. Montezuma County includes the population center and county seat, Cortez. The County has about 25,200 residents (2013), the 21st most populated county in Colorado. The county had a population change of 7.1 percent between 2000 and 2013, lower than both the state's and nation's population change.

Dolores County's median age has increased faster than both the state and national average. Between 2000 and 2013 the County's median age increased from 42.4 to 48.2. Montezuma County's median age also age increased faster than the state and national average with a median age increase from 38 to 42.9 from 2000 to 2013. The state's median age is 36.1 and nationally the median age is 37.3. This increase in Dolores' and Montezuma's median age highlights the number of retirees coming into the areas, attracted to the quality of life and lifestyle amenities offered.

Environmental Justice

Executive Order (EO) 12898 directs federal agencies to focus attention on the human health and environmental conditions for minority and low-income populations. The purpose of EO 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Dolores and Montezuma counties are not very diverse racially, compared to the state or nation. Table 3.5 highlights the percent of the total population in 2013 in the basic race categories from the American Community Survey for the U.S., Colorado, Dolores, and Montezuma counties. With the Ute Mountain Ute and Navajo reservation nearby, the American Indian population in Montezuma County is higher than both the state and national averages. And ethnically, the Hispanic and Latino population in Montezuma County (about 12 percent) nears the nation's average of 16 percent, but still less than the state's average of 20 percent. Otherwise, the county has limited diversity.

Table 3.5. Percent of Total Population by Race, 2013.

	U.S.	Colorado	Dolores County	Montezuma County
Percent of Total Population				
White	74.0%	84.3%	96.2%	83.5%
Black or African American	12.6%	4.0%	0.0%	0.3%
American Indian	0.8%	1.0%	0.9%	11.6%
Asian	4.9%	2.8%	0.3%	0.55

Native Hawaiian & Other Pacific Islander	0.2%	0.1%	0.2%	0.0%
Some other race	4.7%	4.7%	0.0%	1.3%
Two or more races	2.8%	3.4%	2.4%	2.9%

The data in this table are calculated by American Community Survey using annual surveys conducted during 2009-2013 and are representative of average characteristics during this period.

Poverty is an important indicator of economic well-being. For public land managers, understanding the extent of poverty is important for several reasons. First, people with limited income may have different needs, values, and attitudes as they relate to public lands. Second, proposed activities on public lands may need to be analyzed in the context of whether people who are economically disadvantaged could experience disproportionately high and adverse effects under EO 12898. Table 3.6 below highlights the percent of the population below the poverty level in 2013. Dolores County appears to have more individuals and families living under the poverty level than the state averages, but less than the national averages. Montezuma County appears to have more individuals and families living under the poverty level than both the state and national averages.

Table 3.6. Percent of Total Population by Poverty Level, 2013.

	U.S.	**Colorado**	**Dolores County**	**Montezuma County**
Percent of Total Population				
People Below Poverty	15.4%	13.2%	14.9%	19.3%
Families below poverty	11.3%	9.1%	9.4%	14.8%

The data in this table are calculated by American Community Survey using annual surveys conducted during 2009-2013 and are representative of average characteristics during this period.

Regional Economics

In 2015, Colorado's economy continues to improve, largely outperforming the rest of the nation in recent years. Despite relatively robust job growth, Colorado is burdened by the legacy of two acute recessions in 2001 and 2007-2009 that have caused divergences in job recovery rates between the state's metro, and economically diverse Front Range counties that are recovering faster than the smaller, less economically diverse counties in the Central Mountains, Western Slope and elsewhere (CODOLA 2014a). A closer look at Colorado's Four Corners region[1] reveals that the area had approximately 50,440 wage earners and self-employed jobs in 2012. The largest sources of jobs came from the following sectors;

Government (19%),
Retail (11%),
Health Services (11%) and
Accommodations/Food Services (10%).

[1] Consists of Archuleta, La Plata, Montezuma, San Juan and Dolores Counties.

Residents in the Four Corners region receive about 61 percent of their income from earnings, which is lower than the state average of 70 percent. Similarly, the share of government transfers (government payments to individuals) was at 16 percent compared to the state average at 13 percent. These reflect the region's slightly larger share of retirees (people over 65) than the state as a whole (CODOLA 2012).

Another approach to assess the relative significance of different industries in a local economy is through an 'Economic Base Analysis'. This approach looks at how different sectors (e.g. individual industrial sectors and the household sector) bring money into an area and contribute to additional employment throughout the economy. An Economic Base Analysis begins with dividing employment and personal income into two groups:

(1) those that bring in outside dollars to the area and thus are 'basic' to the local economy (directly or indirectly), and
(2) those that are the result of 'basic' spending for local services.

Technical detail on Economic Base Analyses is documented by Colorado's State Demographer's Office (CODOLA 2011). According to an Economic Base Analysis for the Four Corners Region, households (especially spending/non-labor income from retirees) bring in the most significant amounts of money and support about 8,700 jobs in the Four-Corner region; this is followed by the tourism sector, another significant driver generating nearly 8,500 jobs. Agricultural sectors support about 2,600 jobs in the region (CODOLA 2012).

The Economic Environment of Dolores and Montezuma Counties

In Dolores County, about 69 percent of households receive some form of labor earnings, while 39 percent of households receive a portion of their income from Social Security pensions and survivor benefits, and 37.2 percent of households receive a portion of their income from government transfers (such as retirement and medical payments to individuals). The County had approximately 1,500 wage earners and self-employed jobs in 2013. Major sources of employment are from the following industries;

Farming (18.8%),
Government (14.3%),
Construction (10.7%),
Accommodation and Food Services (5.9%) and
Retail Trade (5.7%) (U.S. Department of Commerce 2014).[2]

In terms of wages, the top five industries with the highest labor earnings in Dolores County were;

[2] Data accuracy from Dolores County is consistently low. Analysis from the EPS-HDT indicates that Dolores County data for this section is in the red and orange categories. Data accuracy is indicated as follows: BLACK indicates a coefficient of variation < 12%; ORANGE indicates between 12 and 40%; and RED BOLD indicates a coefficient of variation > 40%.

Construction ($10,027,000),
Government ($8,247,000),
Mining ($2,124,000),
Professional and Technical Services ($1,961,000), and
Retail Trade ($1,879,000).

Across all industries in Dolores County, the average earning per job and per capita personal income are $19,571 and $32,621, respectively. Since 1990, the annual unemployment rate ranged from a low of 4.8 percent in 1990 to a high of 17.7 percent in 2010. The county's unemployment rate was 4 percent in 2014 (US Department of Commerce 2014, US Department of Labor 2014).

A 2013 Economic Base Analysis reveals that the most significant drivers in Dolores County, generating or supporting jobs include;

The agribusiness sector, 170 jobs
Households (especially spending/non-labor income from retirees), 127 jobs
Households (especially spending/non-labor income from commuters), 109 jobs
Households (with Public Assistance Income (excluding retirees)), 49 jobs, and
Households (with Dividends, Interest, and Rental Income (excluding retirees)), 43 jobs (CODOLA 2013).

In Montezuma County, about 75 percent of households receive some form of labor earnings, while 33 percent of households receive a portion of their income from Social Security, and 37 percent of households receive a portion of their income from government transfers. The County had almost 14,500 wage earners and self-employed jobs in 2013. Major sources of employment are from the following industries;

Government (19.6%),
Retail (11.4%),
Health Care and Social Assistance (10.3%),
Farming (7.7%), and
Accommodation and Food Services (7.7%) (U.S. Department of Commerce 2014).[3]

In terms of wages, the top five industries with the highest labor earnings in Montezuma County were;

Government ($133,115,000),
Heath Care and Social Assistance ($52,747,000),

[3] Data accuracy from Montezuma County is mixed. Analysis from the EPS-HDT indicates that Montezuma County data for this section is primarily in the orange category, with some data in the black category. Data accuracy is indicated as follows: BLACK indicates a coefficient of variation < 12%; ORANGE indicates between 12 and 40%; and RED BOLD indicates a coefficient of variation > 40%.

Retail Trade ($50,908,000),
Construction ($41,965,000), and
Other Services, except Public Administration ($25,816,000).

Across all industries in Montezuma County, the average earning per job and per capita personal income are $32,891 and $37,109, respectively. Since 1990, the annual unemployment rate ranged from a low of 3.9 percent in 2007 to a high of 9.8 percent in 1992. The county's unemployment rate was 6.1 percent in 2014 (US Department of Commerce 2014, US Department of Labor 2014).

A 2013 Economic Base Analysis reveals that the most significant drivers in the county, generating or supporting jobs include;

Households (especially spending/non-labor income from retirees), 1,444 jobs
The Tourism sector, 1,314 jobs
Education and Health Services, 1,019 jobs
Households (especially spending/non-labor income from commuters), 935 jobs, and
Households (with Dividends, Interest, and Rental Income (excluding retirees)), 520 jobs (CODOLA 2013).

Ranching Operation

Although the previously described economic base analyses revealed that agribusiness is not a major driver in Montezuma County, agribusiness is the largest source of jobs in Dolores County and the ranching industry in both counties may still be directly affected by agency action. Therefore, a brief overview of the U.S cattle industry is presented here, followed by several relevant statistics specific to Colorado as well as Dolores and Montezuma counties.

Modern beef production in the United States is a highly specialized system that spans from cow-calf operators that typically graze pastureland to cattle feedlots focusing on finishing cattle on grain for slaughter. The structure of the United States cattle industry continues to change, with a greater proportion of cattle being raised on fewer and larger farms. Since the United States cattle inventory peaked in 1975, total cattle inventory has declined 38.3 million head, or 29 percent. During the last 20 years, the number of all cattle operations in the United States has fallen 28 percent, while beef cow operations have declined by 21 percent. The 2010 inventory of cattle and calves, at 93.7 million, represented the third year of downturn of inventory after only three years of increase during the upturn. The beef cow herd, the foundation of the total cattle inventory, has declined 1.33 million head since 2006 (USDA-NASS 2010).

On a retail equivalent basis, per capita beef consumption in the U.S. fell from a high of about 94.1 pounds in 1976 to 77.9 pounds in 1979. Onward from the 1970s, U.S. per capita beef consumption began a slow, steady decline with brief periods of growth to 76.4 pounds in the early 1980s; 67.5 pounds in the early 1990s; and 66 pounds in the early 2000s. Since 2007, lower overall meat production and increased net exports have resulted in higher consumer prices and lower per capita consumption in the United States. Beginning in 2009, U.S. per capita beef consumption fell from 60.8 pounds to 59.4 pounds in 2010 and 56 pounds in 2013. Preliminary forecast shows consumption to remain around 54.4 to 55.1 pounds through 2016.

Per capita beef consumption is expected to decline through 2017, before rising moderately over the remainder of the projection period (through 2024). The near-term decline reflects reductions in beef production over the next several years. As beef production increases in subsequent years, per capita consumption is expected to grow (USDA ERS 2015).

Although per capita consumption has been on a downward trend, prices have climbed over the past two decades, hitting an all-time high in recent years. The average market price received for cattle hovered between $66.6 to $69.5/cwt (per hundredweight) during the late 80s. Prices averaged around $67/cwt throughout the 1990s and early 2000s before overshooting $79.7/cwt in 2003 and steadily rising to $92.2/cwt by 2010. In recent years, the industry has experienced fluctuations. Cattle prices climbed to unprecedented levels in 2011 ($107/cwt) and increasing annually to $122/cwt in 2012, $125/cwt in 2013, $138/cwt in 2014, and an all-time high of $164/cwt in 2015 (USDA NASS 2015). Beef cattle prices are projected to decrease for several years beginning in 2018 when beef production increases, before turning up again toward the end of the production period (2024) as production gains slow (USDA ERS 2015).

The 2012 USDA Census of Agriculture collected farm production expense information at the state-level. For a typical beef cattle ranching and farming operation in Colorado, the total annual farm production expense was $87,265 in 2012. On average, the largest share of the total expense included;

Feed purchased (23.4% of total),
Livestock and poultry purchased or leased (21%),
Cash rent for land, buildings, and grazing fees (6%),
Supplies, repairs, and maintenance costs (6%),
Gasoline, fuels, and oils purchased (6%),
Hired farm labor (5.8%),
All other production expenses (5.6%),
Interest expense (5.6%),
Utilities (2.6%),
Property taxes paid (2.3%),
Fertilizer, lime, and soil conditioners purchased (1.8%),
Custom work and custom hauling (1.3%),
Seeds, plants, vines, and trees purchased (1%),
Chemicals purchased (1%),
Contract labor / rent and lease expenses for machinery, equipment, and farm share of vehicles (1%),
Production expenses paid by landlords (0.2%), (USDA-NASS 2014).

While the largest share of the total expense for a typical cattle operation in Colorado was feed purchases, a smaller, but related expense is grazing fees. The Census of Agriculture does not break out the cost of grazing fees from cash rent for land and buildings, so it is not known how much of that 3.2 percent cost originate from grazing fees (including both public and private rangeland). In the western states, the federal grazing fee for 2015 is $1.69 per animal unit month (AUM) for public lands administered by the Bureau of Land Management (BLM) and $1.69 per AUM for lands managed by the Forest Service. The 2014 fee was $1.35 per AUM.

As for private land grazing, lease rates varied by region. In 2013, the average lease rate for privately owned, non-irrigated pasture in Colorado's southwest region was $14.67/head-month (Tranel et al. 2013). Note that this rate is based on survey results and reflect only the average condition in the region, as feasibility of private grazing varies depending on factors such as proximity to ranch, or, the mere availability of private pasture in the area. The survey conducted by Tranel et al. (2013) also revealed other information about private grazing such as fencing construction and maintenance. About 27 percent of the respondents in Colorado's southwest region reported that the pasture landowner provided labor for fence maintenance; 4 percent of them stated that the costs were shared while 68 percent of them revealed that the tenants (livestock owner) themselves were responsible for fence maintenance labor. As for materials for fence maintenance, about half the respondents reported that materials were provided by the landowners, half by tenants, and a small percentage of respondents reported sharing the cost of materials.

Besides farm expenditure information, the 2012 USDA Census of Agriculture also collected net cash farm income data for cattle farming operations. In Colorado, there were 4,123 beef and cattle ranching and farming operations reported positive annual cash income in 2012, with an average net gain of $69,536; while a total of 6,405 operations reported negative annual cash income in 2012, with an average net loss of $24,488 (USDA-NASS 2014). As discussed earlier in this section, livestock prices are volatile; therefore, it is important to note that annual cash flow also fluctuates for agribusinesses. As in other businesses, ranchers may operate at a loss for as long as cash reserves hold out, and, that the growth potential (again, as in any other businesses) depends on the entrepreneur. Entrepreneurships and motivation are important in the desire to maintain a traditional enterprise such as ranching. Ranchers are not often in the livestock business not just to make a profit, but because they value the quality of life that comes with the ranching lifestyle (Rowe, Bartlett & Swanson, 2001).

Gentner and Tanaka (2002) found that public land ranchers ranked lifestyle attributes above profit maximization. Family tradition, culture and values are some of the more important reasons for maintaining a ranching operation. In Gentner and Tanaka's survey, public land ranchers were asked a series of questions regarding possible strategies when faced with different scenarios, for example, the elimination of seasonal uses of federal grazing and reducing AUMs. For the 'corporate ranchers' group (containing a large number of cow-calf-yearling operations), when faced with the hypothetical prospect of elimination of federal grazing in the summer months, about 35 percent of the respondents stated that they would cut back on livestock production, pass down to next generation, reduce herd, or sell the ranch; a little less than 30 percent of the respondents were not sure what they would do in the face of this change; about 15 percent stated that they would intensify their use of private grazing land; about 15 percent of the respondents stated that they would continue their current level of operation; while less than 10 percent stated that they would diversity their operations either on-ranch or off-range[4]. Similar responses were given to the scenario of a 50 percent reduction

[4] Examples of diversifying operation include pursuing more or better off-ranch employment, growing different crops for cash sale, offering ranch based recreation, or adding a new class of livestock.

in AUM for this group. Gentner and Tanaka (2002) concluded that public land ranchers are very heterogeneous in terms of their income sources as well as motivations to maintain a ranching operation (from ranch income dependent, to hobby operations, and somewhere in between). Therefore, the assumption that all ranchers operate under the same motivation (i.e. profit maximization) is unfounded.

Ranch Viability and Land Use

As communities and urban areas grow, the price of neighboring agricultural land increases until it exceeds the income-producing potential the land can provide to farms and ranches. Not only does this happen at the edge of communities, it also happens in attractive settings at the edge of National Forests. Base ranch properties of National Forest grazing permittees have experienced development pressures in many growth areas across the west, especially near mountain resorts or other communities that offer a variety of amenities. Second-home development can be a significant source of demand for ranch properties in these areas. In addition to attractive land prices, ranchers may also face challenges in terms of operation costs and livestock prices, all subject to local and national markets (i.e. fluctuating prices and consumption demand as discussed in previous section). When costs rise or livestock prices fall – affecting the profitability ranch operations – high land prices make land sales an increasingly attractive source of income.

Gentner and Tanaka's survey presented some noteworthy questions faced by public land permittees, such as the seasonal elimination of federal grazing and reduction of AUM's. While the majority of ranchers from Gentner and Tanaka's study revealed that they would not sell the ranch when faced with such scenarios; the concern of land use change (through base ranch properties sales) due to financially non-viable operations is recognized. This issue is about indirect effects, and hinges on whether public land permittees continue operating under reduced or no grazing scenarios. As discussed earlier, individual permittee's financial situation, entrepreneurial capabilities, motivation, etc. are not generally homogeneous, so it is unsound to simply assume a particular chain of event (e.g. base property sales due to increased operational costs, etc.). Nevertheless, agricultural lands and projected land use changes in Dolores and Montezuma counties are examined below.

A 2014 property assessment study reviewed county records to determine major land categories in Dolores and Montezuma counties: irrigated farm, dry farm, meadow hay, grazing and other lands. Acreage and land value information are compiled by land classes. In Dolores County, of those lands classified as private agricultural uses, 44.5 percent belongs in the grazing land class ($6/acre on average), 35 percent in the dry farm land class ($13/acre), 16.5 percent in the waste land class ($2/acre), 3 percent in the sprinkler land class ($61/acre), 0.7 percent in meadow hay land class ($64/acre), and 0.1 percent in the forest land class ($7/acre) (Wildrose Appraisal 2014a). In Montezuma County, of the lands classified as private agricultural uses, 59 percent belongs in the grazing land class ($6/acre on average), 19 percent in the dry farm land class ($22/acre), almost10 percent in the flood land class ($147/acre), 6 percent in the meadow hay land class ($39/acre), and 6 percent in the sprinkler land class ($161/acre) (Wildrose Appraisal 2014b).

In support of the 2010 Renewable Resources Planning Act (RPA) Assessment, the U.S. Forest Service forecasted changes in land uses for the United States in response to three scenarios[5] (Wear 2011). Total acreages of nonfederal cropland, pasture, forest, range and urban lands are projected through 2060. Nonfederal urban and built-up land area growth varies by region, the Rockies is projected to gain about 11 million acres by 2060 (a 153% increase from the 2007 reference period). Currently less than 3 percent of Dolores and Montezuma counties' land area is in the urban/built-up land class. Grazing is the largest class of private agricultural lands (and of relatively low value on a per acre basis) according to the 2014 private property assessment described above; nevertheless, pasture and rangeland still constitute the majority of land cover conversion projected to occur by 2060. In other words, if and when lands use changes occur in the county (gains in urban / built-up area); it is likely that those gains will come from the conversion of pasture and rangelands (Wear 2011).

In discussing concerns regarding open spaces, it is important to distinguish between open spaces on public land versus private land. Private land open space may offer scenic, wetland, wildlife habitat, watershed condition, and related benefits. Pastoral landscapes on private lands are often highly valued in certain communities for their scenic and cultural importance. Generally, private land open space does not offer recreation use benefits to the public, although hunting privileges may be extended to certain parties. In addition, private land owners that have not sold developmental rights (e.g. conservation easements) retain the option for future land conversion.

Dolores and Montezuma Counties' Cattle Industry and Regional Economic Contributions
Analysis of Grazing on the Glade Landscape

From the 1925 Agriculture Census, 46 farms in Dolores County reported a total of 2,867 cattle, with a total value of $78,720 (over $1 million in 2012 dollars). In 1945, 166 farms in Dolores County reported a total of 3,202 cattle, valued at $197,100 (over $2 million in 2012 dollars). In Montezuma County, 309 farms reported a total of 18,327 cattle in 1925 with a total value of $479,012 (over $6 million in 2012 dollars). In 1945, 767 farms in Montezuma County reported a total of 18,985 cattle with a total value of $1,168,665 (over $14 million in 2012 dollars). After the peak of mid-1940s, cattle productions in Dolores and Montezuma counties followed the national trend of steady decline (U.S. Department of Commerce 1927; 1946). By 2012, there were a total of 58 cattle operations in Dolores County with a total inventory of 4,108 cattle; out of which 3,423 were sold for $3,625,000. In Montezuma County, there were a total of 412 cattle operations with a total inventory of 22,288 cattle; out of which 15,985 were sold for $15,133,000 in 2012 (USDA-NASS 2014). Dolores County's total cattle inventory ranked 50th among counties in Colorado; among counties nationwide, Dolores ranked 2016th. Montezuma

[5] The three RPA scenarios are linked to globally consistent and well-documented scenarios used in the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment (AR4): The A1B, A2 and B2 scenarios. The A1B scenario assumed a mild range population growth and high per capita disposable personal income level through 2060; the A2 scenario assumed a high population growth and low per capita disposable personal income level through 2060; while the B2 scenario assumed low population growth and mid-level per capita disposable personal income.

County's total cattle inventory ranked 29th among counties in Colorado; among counties nationwide, Montezuma ranked 1007th (USDA-NASS 2014b).

Ranching operations have economic linkages with other sectors of the economy besides livestock and agricultural sectors. In fact, changes in grazing activities on NFS lands have implications for the overall regional economies surrounding Dolores and Montezuma counties. An economic contribution analysis is presented here, in order to estimate income, and the employments sustained/supported by AUMs permitted to graze on the Glade landscape. It is important to stress that this analysis does not attempt to calculate the economic impacts from all cattle and their ranchers; rather, this AUM-based analysis estimates only the share of employment and income derived from permitted grazing on active Forest Service allotments on the Glade landscape. Ranchers use Forest Service forage for only a portion of their operations (i.e. summer months), therefore, Forest Service forage accounts for a fraction of the annual feed and forage requirements, which, in turn, only a portion of their operations' revenue and associated economic impacts can be reasonably attributed to NFS land and management. For this reason, the Forest Service relies upon an AUM-based approach for estimating those economic contributions derived from forage provided by authorized grazing on existing allotments on the Glade landscape.

For the eight active allotments, annual average use was 19,568 permitted AUM for cattle during the past five years. This figure is close to the actual use that occurred and was billed. Using this actual AUM usage information along with agency economic contribution model, the regional economic effects in terms of employment and income are estimated. On an annual average basis, permittees grazing on these allotments support/sustain approximately $761,000 in labor income (2014 USDA-ERS) and 41 full and part time jobs in the economy of Dolores and Montezuma counties. These results reflect indirect and induced economic effects – private sector activities stimulated by Forest Service grazing entering the region's economy – in addition to direct employment and income effects.

3.7.2 Environmental Consequences

Direct and Indirect Effects Similar to All Alternatives

In Montezuma County, there is both a tribal population and a Hispanic/Latino population that are potentially of interest to land managers. Tribes are engaged with government to government consultation for projects to ensure tribal issues and concerns are addressed throughout the planning processes. With tribal consultation continuing throughout the project, no disproportionately adverse and negative impacts are expected under any of the alternatives to the tribes. Please see the Public Involvement Section (1.9) of this DEIS. It is assumed no disproportionate adverse and negative impacts are expected under any of the alternatives.

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

Public lands contribute to the competitive advantage of the livestock industry, because in some places the contribution is a low-cost alternative to private grazing lands; while in other places, the contribution is the only opportunity for summer range where limited or no private grazing exists. The No Action Alternative would reduce public land available for livestock grazing by roughly 164,000 acres. This acreage includes NFS lands from all the allotments in the landscape.

For the permittees, this alternative effectively eliminates summer forage opportunity (June until late October is generally the permitted season of use on the Glade landscape). While this alternative does not directly dictate permittees' ranching operation during the rest of the year when livestock are off NFS land, it would, however, create burdens in terms of operating costs, and could be potentially detrimental for operations nearing, or already financially non-viable and are economically dependent on federal grazing. This is important since summer and early fall are important months for growth of livestock, in preparation of market, slaughter, or feedlot sales for further fattening. As discussed in the Affected Environment, for the average cattle operation in Colorado, the largest share of the total expense was feed purchase (23.4% of total). Note that even for public lands ranchers, some of this cost is incurred during the eight or nine months while livestock are off NFS lands – excluding time grazed on owned base property or other private pastures, if available. Eliminating grazing on the Glade landscape obliges permittees to obtain alternative summer forage (private pasture, other state and federal lands, if available and feasible), or, more likely, incur the costs of additional feed purchases. In any case, the elimination of federal grazing substantially increases a permittee's operation costs.

These costs on the permittees may not be offset by revenues from marketable gains of livestock, making the ranching business financially non-viable. This analysis alone cannot predict that the permittee would cease livestock operations or put the base property up for sale. Typically, many factors contribute to such a decision. As in other businesses, ranchers may operate at a loss for as long as cash reserves hold out, and, that the growth potential (again, as in any other businesses) depends a great deal on the entrepreneur. Besides entrepreneurships, motivation plays an important role for the desire to maintain a traditional enterprise such as ranching. Continuing operation, diversification, seeking off-ranch employments, or ceasing operations are some of the responses public lands ranchers have considered when faced with the prospect of reduced/eliminations of federal grazing. Detailed discussions and related research findings are found in the Affected Environment, Ranching Operation section. In terms of regional economic impacts, if off-ranch employment becomes the chosen route – either full-time or as supplemental income for sustaining a financially non-viable ranch – some additional direct and indirect effects (employment, income, etc.) will continue to occur in the local economy. On the other hand, if current permittees cease to operate and no further action is taken, those indirect economic contributions to the local economy as described in the Affected Environment section will not be sustained. This is in addition to the losses in direct income, employment, way of life and values associated with maintaining a traditional enterprise such as ranching. It is important to note that the issue of ranch viability (and subsequent land use changes, etc.) hinges on the concept of indirect changes. These effects are not the sole result of Forest Service range management decisions. However, Forest Service management becomes a key contributor if financial viability of the existing operation is doubtful.

Concerns regarding land use changes (through base ranch properties sales) due to financially non-viable operations are also recognized. This issue is about indirect effects, and hinges on whether public land permittees continue operating under this no grazing scenario. As discussed earlier, individual permittee's financial situation, entrepreneurial capabilities, motivation, etc. are not homogeneous; therefore it is unsound to simply assume a particular chain of events (i.e. elimination of seasonal grazing opportunity leads to base property sale, etc.). Nonetheless,

this important concern is examined here. Should the permittee find that livestock operations ranch-wide are no longer sustainable in the long-run, sale of the base property – or a sub-divided section of it – could occur. Should this happen, land use may or may not change. It should be noted that if ranch base property sale is considered, some buyers may keep lands in agricultural use, regardless of profitability (e.g. hobby, non-profit agricultural operations, creation of conservation easement, etc.) and maintain the lands as private open space for their scenic, habitat, and other environmental values. On the other hand, other buyers may convert land to developed uses such as residential and possibly commercial. Changes in land use from agriculture to either residential of commercial use decreases private open space. Given the large share of land that is considered open space in the county (see previous section on statistics from the RPA study), such a change would generally be inconsequential in the broader landscape. Finally, the discussion thus far is restricted to the mere calculation of acreages of different land cover types; it is important to remember that reductions in open space could affect current benefits to the local community such as pastoral landscapes, wetlands, wildlife habitat, and watershed condition. See other sections in this DEIS for a more detailed analysis of those effects.

Under Alternative A, the Forest Service would receive no revenue from grazing fees, and incur no long-term permit administration cost on the strict basis of AUM permitted on the Glade landscape.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

Continuation of the current situation would not create any further costs to operations grazing on NFS lands. Outside forces, such as interest rates, fuel prices, or market conditions could change the margin of profit for any operation regardless of AUM's grazed on federal lands, but there would likely be no change from the current economic situation due to Forest Service action. All else equal, the regional economic contributions deriving from livestock grazing as presented in the affected environment section[6] would likely be sustained, given current AUM usage

Alternative B would continue to bring in grazing fee revenue. Grazing fees are set based on a formula established by Congress. The formula is not subject to change by the Forest Service.

Further discussed in other sections of this DEIS, current grazing management presents some undesirable ecological impacts, particularly to soils, vegetation and water resources, and would continue to degrade if not adequately addressed. This could represent a long-term cost to the agency and permittees if degradation of resources makes sections of the current allotments unsuitable or less suitable for current grazing levels. Thus, the desirability of no increases in short-term costs, could be outweighed by long-term loss of forage quality or forage availability and degradation of other resource values.

[6] Economic contribution of approximately $716,000 in labor income (2014 USD), as well as support / sustain about 41 full and part time jobs in the regional economy.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Alternative C requires allotments be managed more actively than Alternative B due to new design criteria and/or adaptive management. Because of the flexible nature of adaptive management, it is difficult to predict the impact to ranching operations. Some operators may be effective in monitoring and adjusting to adaptive management options, while others may be unable to adapt to the new conditions. As with Alternative B, outside forces play a large role in the ability for ranchers to maintain an operation's profitability. This alternative may not make any difference for permittees currently utilizing the project area that are able to effectively implement adaptive management measures.

Some ranches may not be able to adapt to the new management practices and/or profit margins could become too small to remain in business. Some ranching operations could possibly fail. See Alternative A for detailed discussion regarding factors affecting such business decisions. If permittees are able to adapt to the increased costs of grazing implementation and improvements, all else equal, the regional economic contributions deriving from livestock grazing under Alternative B would likely be sustained, given proposed AUM usage.

Alternative C provides AUMs not to exceed approximately 18,000 AUMs. This use would sustain/contribute $701,000 in labor income (2014 dollars) on an average annual basis, as well as support/sustain about 38 full and part time jobs in the regional economies. These results reflect indirect and induced economic effects – private sector activities stimulated by Forest Service grazing entering the local economy – in addition to direct employment and income effects.

Although Alternative C would bring in grazing fee revenue, it is not anticipated that the costs of permit administrative as well as cattle range improvement costs (shared with permittee) would be offset by the grazing fees revenue. However, the Proposed Action with adaptive management represents the most ecologically sustainable alternative while maintaining permitted livestock grazing practices on the landscape. By maintaining the rangeland to permit specifications outlined in the Proposed Action Alternative, long-term ecosystem services would be maintained and improvements to range health, such as improved or enhanced foraging conditions, would represent a long-term benefit to the Forest Service and permittees. This long-term benefit also represents a reduction in future costs that would be incurred if the ecological function of the landscape had deteriorated under Alternative B. Future value and potential use of the Glade landscape would be reduced if ecological functions deteriorated to a point where the forage resource could no longer sustain cattle ranching operations or had to be reduced; thus, the long-term benefit of maintaining ecosystem services and ecological function outweigh short-term costs that may be incurred by complying with permit terms and conditions.

Many of the costs and benefits associated with this Alternative are not quantifiable or accurately portrayed. These costs and benefits are described qualitatively, in the individual resource sections of this DEIS. Management of National Forest lands is expected to yield positive net benefits for the American public – including the consideration of all other non-market benefits and costs. As discussed above, the retention of ecosystem services and ecological function in the area would result in long-term benefits to the Forest Service and permittees. These management actions, however, may or may not yield financial net revenues.

3.8 Heritage Resources

3.8.1 Affected Environment

The San Juan National Forest is located in southwestern Colorado, an area with a long and rich cultural heritage. Occupation in southwestern Colorado dates back to approximately 10,000 B.C. with the first migrations into the area by the Paleoindian peoples. Since that time the area has been occupied by various Native peoples and Euro-American groups. Cultural groups that have occupied or migrated through the area include (but are not necessarily limited to) the Ancestral Puebloan (Anasazi), the Ute, the Navajo, Spanish explorers and settlers, Basque Herders, and a mix of Euro-American miners, ranchers, loggers, farmers, and other settlers. Periods of occupation can be generally outlined as follows.

- Paleoindian (10,000-5500 B.C.)
- Archaic (5500 B.C. – A.D. 1)
- Basketmaker II (A.D. 1-450)
- Basketmaker III (A.D. 450-750)
- Pueblo I (A.D. 750-900)
- Pueblo II (A.D. 900-1075)
- Pueblo III (A.D. 1075-1300)
- Protohistoric (A.D. 1300-1760)
- Historic (A.D. 1760 – Present)

Cultural Resource site condition is at any point in time the result of the effect of a great number of factors consisting of both natural forces and modifications occurring as a result of human activity. Domestic livestock grazing has occurred in the southwest since European contact and has been a permitted activity on the Forest since it was established in 1905. Wild ungulates have also inhabited the area, potentially in large numbers, since they arrived or evolved here. As a result, effects to cultural resources from grazing by both wild and domestic animals have likely occurred as a result, and are considered as part of the existing condition.

A variety of project activities, especially those that result in ground disturbance can potentially affect the condition of cultural sites. Both historic and prehistoric sites are known to occur within the Glade analysis area. Prehistoric site types found in this area include small seasonal-use campsites, resource procurement sites, and Ancestral Puebloan habitation sites. Historic properties primarily include sites related to early mining, logging, and ranching activities.

3.8.2 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

Under this alternative no livestock grazing would occur in the Glade analysis area. This alternative would best benefit cultural resource properties through the elimination of potential direct and indirect impacts from livestock grazing within those allotments. Any proposed monitoring or mitigation measures designed to address impacts from livestock grazing would no longer be applicable.

If selected, Alternative A would require the removal or elimination of existing structural range improvements such as fences, corrals, water developments, etc. Because these actions have the potential to affect historic properties, any ground disturbing activities associated with removal of structural improvements may require a separate field survey and State Historic Preservation Office (SHPO) consultation prior to implementation. This would be on a case by case basis depending on the type of disturbance anticipated, and the findings of prior surveys within the project area.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

General use of the Glade analysis area for cattle grazing is an historic usage and continuation is not expected to cause direct effects to the qualities that make individual cultural resource sites eligible to the National Register of Historic Places. The occasional grazing or passing of cattle over a prehistoric lithic scatter site for example does not normally alter the site in any significant way. Historic features such as old cabin foundations, carvings or blazes on trees, mining remnants or other historic materials are usually not affected by ungulates. In addition, alternatives that move other environmental resources towards meeting their desired conditions may also result in a beneficial effect on cultural resource sites by stabilizing the ground surface and slowing the effects of erosion and other natural processes. Heavy use such as trailing and congregating of stock on or across sites can cause damage to cultural resources in the form of increased erosion (indirect effect) and damage to surface artifacts or features (direct effect). The use of riders and careful selection of salting locations can aid in stock distribution to avoid heavy use in sensitive areas.

Alternatives B and C include the use of existing structural range improvements, and may also require construction of additional improvements such as fence lines, reservoirs, or other facilities. Selected springs may be improved through installation of spring boxes, pipes, and troughs to allow the cattle to use the water while also restoring natural drainage patterns around the spring. The specific actions and locations for such improvements have not yet been determined. Any new fence, spring improvement or other new structural range improvements or ground disturbing activities would require on-the-ground cultural resource survey and consultation with SHPO prior to implementation. All new structural range improvements would be constructed in a location and manner designed to avoid impacts to all eligible or unevaluated (need data) cultural sites.

The Anasazi Archaeological District is a National Register Historic District that is located within the southwestern portion of the Glade analysis area. It contains a dense concentration of prehistoric sites and also contains sites that tend to be more sensitive to cattle grazing, including sites with rock shelters and/or standing architecture. To protect this area, stock activities should be limited to the use of existing historic stock driveways for moving stock across the district and into allotments in the general forest area. General grazing should not be allowed within the historic district.

Alternative B would continue current grazing activities without any changes in numbers, grazing periods, or management practices, and would therefore not reduce the current stress on cultural sites from grazing activities or from indirect effects such as increased erosion.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Impacts from this alternative are basically the same as Alternative B, except that ground disturbing impacts are lessened and additional standing vegetation is retained through better management; therefore some beneficial effect associated with Alternative C may help maintain soil stability and cultural artifact protection. In addition, the adaptive management strategies proposed in Alternative C, if used appropriately, should lead to improvements in the general condition of the landscape moving the condition from its current condition toward reaching the established desired environmental condition. Improving the health and vigor of the landscape environment is beneficial to stabilizing the soil, limiting erosion, and lightening the impacts of general grazing across the landscape. Though not as desirable as Alternative A from a cultural resource standpoint, this alternative if appropriately managed, would aid in protecting and preserving cultural resource sites and therefore would be better than Alternative B.

3.9 Rangeland Resources

3.9.1 Overall Affected Environment

The Forest Plan describes lands suitable for livestock grazing (Page 69) and provides a map of suitable and capable rangelands (Figure 2.7.1, Page 73). Seventy two percent (119,213 acres) of the Glade landscape range analysis area is identified as suitable for livestock grazing.

The interdisciplinary team for the Glade analysis examined Forest Plan information for site-specificity on the Glade landscape. Their conclusion was that the Forest Plan analysis adequately captured the extent of lands suitable for livestock grazing. No Forest Plan amendment related to rangeland suitability is needed for this project.

Although allotment boundaries and pasture boundaries are drawn primarily around suitable ground, there are pockets or areas of unsuitable lands within each of the allotments. Livestock usually pass through and do not spend a lot of time in these areas (observations by range staff).

The table below displays the acres of range suitability by vegetation type within each allotment.

Table 3.7 Acres of range suitability according to vegetation type

Allotment	Primary Vegetation Types (Acres)*							Total Suitable Acres
	Grassland	Sagebrush Parks/ Shrubland	Ponderosa Pine	Aspen	Pinyon/ Juniper	Mesic Meadow	Riparian/ Streams	
Brumley	2,919	17,854	3,658	975	5,811	108	0	32,610
Calf	2,270	2,656	2,917	549	31	36	0	8,857
Glade	1,290	3,323	10,774	615	1,560	112	2	18,001
Lone Mesa	260	1,813	223	447	1,158	13	1	4,429
Long Park	492	2,650	6,096	369	167	30	0	10,449
Mair	960	8,811	15,814	788	136	22	0	27,340
Sagehen	3,153	1,611	524	3	1,385	16	36	7,163
Salter	722	4,364	4,203	280	193	281	3	10,567
Approximate Total Suitable Acres = 119,213 (or 119,416 if allotments looked at separately)								

*Grasslands = Only those areas mapped as grass;
Sagebrush/Shrublands = Areas mapped as gamble oak, shrub, true mtn. mahogany, big sagebrush, saltbush/greasewood, snowberry serviceberry/oak;
Ponderosa Pine = Only those areas mapped as Ponderosa Pine;
Aspen = Only those areas mapped as aspen;
Pinyon/Juniper = Only those areas mapped as pinyon/juniper;
Wet Meadow = Areas mapped as rushes, tufted hairgrass/sedge, and willow; and
Riparian/Streams = Areas mapped as water.

A *range analysis grazing capacity* study was not conducted for the allotments within the Glade landscape as part of this analysis. Capacity calculations were completed in the past (1980-1995) and the interdisciplinary team felt capacities were close with only minor adjustments needed. In some cases stocking needs to be adjusted based on management issues such as distribution and use patterns. Therefore, adjustments to those variables may be made.

The following table represents the current *permitted stocking rate* for each allotment within the Glade Rangeland Management Area. Although Term Grazing Permits outline livestock operations, what actually occurs can be different, usually less, than on the permit. This is called actual use. The *actual use stocking rate* differs from permitted on several allotments. As a general rule, a stocking rate of less than 6 acres/AUM is considered high, 6-10 is considered moderate, and greater than 10 is considered low.

Table 3.8 Permitted livestock operations for Glade landscape allotments

Allot-ment	Suitable Acres	Current Grazing System	Live-stock No.	Permit Dates & # Days	Permit AUM	Stocking Level: Acres/AUM	Ave Actual Use AUM	Ave Actual Use Acres*/AUM
Brumley	32,610	10 pasture Rest-Rotation	590	5/20-10/30 (164 days)	4199	7.77 (mod)	3185	10.23 (mod.)
Calf	8,857	6 pasture Deferred	348	6/1-10/30 (152 days)	2295	3.86 (high)	2179	4.0 (high)
Glade	18,001	7 pasture Deferred	458	6/15-10/30 (138 days)	2743	6.56 (mod)	2592	6.9 (mod.)
Lone Mesa	4,429	5 pasture Deferred	70	5/26-10/30 (158 days)	480	9.22 (mod)	844	9.22 (mod)

Allot-ment	Suitable Acres	Current Grazing System	Live-stock No.	Permit Dates & # Days	Permit AUM	Stocking Level: Acres/AUM	Ave Actual Use AUM	Ave Actual Use Acres*/AUM
Long Park	10,449	4 pasture Deferred	450	6/1-10/25 (147 days)	2790	3.74 (high)	879	11.88 (low)
Mair	27,340	5 pasture Deferred	650	6/1-10/30 (152 days)	4287	6.38 (mod)	3108	8.79 (mod.)
Salter	10,567	8 pasture Deferred	420	6/1-10/30 (152 days)	2770	3.81(high)	2735	3.86(high)
Sagehen	7,148	Stock Driveway		Spring & Fall			N/A	N/A

*Based on suitable acres

Changes in vegetation such as lack of maintenance of old range improvements (chainings, rollerchoppings, sagebrush spraying, fire, timber harvest, etc.) may have resulted in changes in grazing capacity.

The following Table 3.9 summarizes range structures that currently exist on each of the allotments within the Glade landscape.

Table 3.9 Range structures on Glade landscape allotments

Allotment	# Corrals	# Reservoirs	# Springs	# Cow Camps	Miles of Fences*
Brumley	1	45	8	1	57
Calf	3	23	-	1	16
Glade	1	34	4	-	22
Lone Mesa	-	21	-	-	15
Long Park	-	22	-	-	14
Mair	2	63	9	1	21
Sagehen	5	-	1	-	18
Salter	-	27	-	1	20
TOTALS	9	235	22	4	183

*These are only the allotment interior fences that are not shared between allotments, which include many more miles.

3.9.2 Allotment Specific Affected Environment

Every allotment on the Glade landscape has improved tremendously from historic conditions. Problem areas remain which is the focus of the following allotment descriptions.

Brumley Allotment

History- Actual use Animal Unit Months within the Brumley Allotment have dropped from a high of 9,747 in the 1940's to a low of 2,596 in the early 2000's and is currently at 4,174. Season of use has changed from 214 days (5/1 – 11/30) in the 1940's to 163 days (5/20-10/30) today. The Ryman area was described in 1961 as needing 15,000 acres of restoration since it is critical deer winter range, it was being over-used by livestock and big game, and was heavily eroded because of Mancos shale soils. This concern continued to the point that around 1967 a proposal to close Ryman and Disappointment units to grazing was implemented. In 2001, a

legal action taken against a permittee resulted in the permittee being reduced from 6,426 AUMs to 4,199 AUMs (-2227 AUMs). To date the lost AUMs have not been reissued.

Numerous vegetation treatments have occurred within the Brumley Allotment. The following is a list of what has been recorded in historic files:

Treatment	Treatment Years	Total Estimate Acres
Pine Plantation	1961, 1964, 1968	1,956
Pinyon/Juniper Chaining	1968	1,500
Herbicide Brush Control	1987	1,000
Prescribed Fire	1971	?
Wild Fire	1996, 2005	2,730

Actual Use- The following Table shows the actual use within the Brumley Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1941	1008	5/1-11/30	11304	Unknown
1948	1180	5/1-10/31	7737	Rotation
1949	1730	5/16-10/31	8879	Rotation
1956	1549	5/16-10/31	6824	Rotation
1962	742	5/16-10/25	4926	Rotation
1971	929	5/16-10/25	6765	Rotation
1981	937	5/16-10/25	6426	Rotation
2001	354	5/12-10/27	2596	Rest-Rotation
2006	420	5/19-10/30	3007	Rest-Rotation
2008	475	5/30-10/30	3175	Rotation
2009	510	5/18-10/31	3696	Rotation
2012	550	5/5-10/30	4272	Rotation

Range Condition and Trend- Rangeland Health Assessments were completed for the Brumley Allotment in 2007. Eleven Parker 3-Step transects were established starting in 1956 in the Near Draw, Far Draw, Disappointment, Ryman and Royce pastures. Rooted Nested Frequency transects were established in the pastures listed above between the years 2000 and 2007. Nineteen Cover Frequency transects were read in 1991 and 1992. One was re-read in 2007. Conditions were recorded at four of these locations. Hydrologic monitoring evaluated 23 sites between 1993 and 2007.

Overall this allotment is showing improvement. Long-term trend transects in New Draw, Far Draw, Disappointment, and Ryman pastures are trending upward. Specific problem areas identified include the following (Table 3.10):

> *Springs, seeps and riparian* areas are in poor condition. Bare ground is the most widespread issue with 10 out of the 13 hydrologic locations having moderate to extreme departures from reference conditions. Water flow patterns, pedestals, and compaction layer occur in about half of the hydrologic areas assessed. Gullies are a common feature in the Ryman pasture.

Pinyon-juniper areas, particularly on the Ryman, Royce, Plantation and Disappointment pastures lack litter, crusts, and mat forming vegetation which minimizes overland water flow. Where litter and biological crusts are present, they are in inadequate amounts to capture water and prevent erosion. Often litter is abundant in diverse age-class stands of pinyon-juniper but absent in even-aged stands (especially older aged stands) because most of the litter washes away with overland water flows. Bare ground is more continuous, mats of vegetation are discontinuous and rills/pedestals are more prevalent in these even-aged pinyon-juniper woodlands. Benefits from old chaining treatments were evident for 20-30 years following, but have since declined. In some cases, these areas are now being dominated by rabbitbrush, snakeweed, and cheatgrass causing a downward trend.

Mountain grassland parks lack native bunchgrasses, have poor species composition, and have a high percentage of bare ground. This is particularly evident in Far Draw and Near Draw where the invasive species such as, mule's ear (*Wyethia*), has steadily been increasing, reducing forage production. In these pastures, the soil condition has improved but the vegetation condition continues to be poor and in many cases declining.

Table 3.10 Primary resource concerns and key sites where concerns have been documented

Resource Concern	Key Sites
Poor conditions of springs, seeps, and riparian areas	Springs, seeps and riparian areas in Plantation, Black Snag, Near Draw and Far Draw pastures, particularly tributaries to Dawson, Rock Spring, and Cole Spring
Lack of litter, crusts, and mat-formation to minimize overland flow connections	Ryman and Plantation pastures, particularly in pinyon-juniper vegetation type
Mountain grassland parks lack of native bunchgrasses, poor species composition and high percentage of bare ground	Far Draw and Near Draw pastures

Calf Allotment

History- Actual use Animal Unit Months have dropped in the Calf Allotment from a high of 3,308 in the 1940's to a low of 1,987 in the 1960's and is currently at 2,295 AUMs. Season of use has changed from 183 days (5/16 – 11/15) in the 1940's to 139 days (6/1-10/17) in the 1990's to 152 days (6/1-10/30) today.

This allotment has had a long history of poor management starting in the 1940's from poor salting, lack of herding, and overstocking. Notes from the 1940's through the 1970's, 1980's, and into the 1990's state overutilization, poor livestock distribution, poor conditions, weed issues, grasshopper/Mormon cricket issues, erosion, heavy concentrations of undesirable forbs, impacts from sawmill, sheep trailing, logging, and poor road construction/maintenance. The Dunham Unit is continually mentioned in the historic records as a perpetual problem area along with Hoppe Point. Plantation has generally looked good.

Things appear to start turning around about 1994 with some problems still existing. Willow is becoming established along riparian corridors and Forest Plan standards are starting to be met in the Dunham Unit. Problems persist in the Hoppe Point pasture from excessive utilization. Bare ground in the Plantation unit is recorded to be as high as 50%. Historic records at this time continually mention thistle problems.

A historic stock trail existed in Dry Canyon until McPhee Reservoir was constructed. Today a stock trail exists that runs across the west boundary of Sagehen, down to the dam then up the other side to the north. This trail runs through Calf Allotment coming up on top at Hoppe Point. The stock driveway was constructed in 1985 by the Bureau of Reclamation to provide access after construction of the reservoir. It is used both in the spring and in the fall but mostly in the fall by at least 6 livestock operators.

Numerous vegetation treatments have occurred within the Calf Allotment. The following is a list of what has been recorded in historic files:

Treatment	Treatment Years	Total Estimate Acres
Pine Plantation	1988	?
Herbicide Weed Control	1991, 1998, 2003, 2004 2012	400
Herbicide Brush Control	1958	178

Actual Use- The following 1shows the actual use within the Calf Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1941	414	5/16-11/15	3308	Season-Long
1951	309	5/26-10/26	2058	Season-long
1961	303	6/1-10/31	1987	Rotation
1971	368	6/1-10/30	2429	Rest-Rotation
1981	343	6/1-10/30	2262	Rotation
1991	352	6/1-10/17	2124	Rotation
2001	348	6/1-10/30	2335	Rotation
2011	348	6/1-10/30	2335	Rotation
2013	348	6/1-10/30	2335	Rotation

Range Condition and Trend- Four Parker 3-Step transects were established on the Calf Allotment starting in 1953 in the Tozer, Hinchman and Dunham pastures. Rooted Nested Frequency transects were established in the pastures listed above in 2008. Hydrologic monitoring evaluated 12 sites between 1992 and 2013.

Overall this allotment has improved over time but seems to be stalled out and no longer improving and in some cases actually declining. According to long-term transect data; Hinchman, Plantation, and Salter Canyon are showing signs of good hydrologic health where Tozer, Dunham, and Hoppe Point are not. Dunham is declining in upland range health, Hinchman is fluctuating and Tozer was improving but is now declining. Specific problem areas include the following (Table 3.11):

Springs, seeps and riparian areas are in poor condition in Hoppe Point, Dunham and Tozer pastures primarily due to cattle loafing. Some of these areas are drying given

the compaction and trampling they have received exacerbated by drought. Headcuts and gullies are evident.

Swales or low gradient drainages in Hinchman, Plantation and other pastures have poor plant species composition with little riparian vegetation and in some locations they have bare banks. Insufficient ground cover and the presence of shallow rooted grass species (Kentucky bluegrass) in swales results in overland water flow, lack of soil water holding capability, lack of sediment retention from overland flow, and the resultant erosion. The predominance of livestock use occurs in grass parklands, particularly where swales exist. Swales are often shallow and pool soil moisture providing greener lusher forage. As they receive excessive over-use, however, desirable species diminish, shallow-rooted species such as Kentucky bluegrass prevails, and soils dry out. As pressures progress, the lack of litter and the loss of soil moisture results in bare ground and ultimately bare channel banks due to erosion.

Mountain grassland parks such as those found in Hinchman and Plantation pastures, lack ground cover and native bunchgrasses. While there has been improvement in this allotment from historic conditions, some of the locations where improvements were recorded have stalled out or started to decline. This may be the result of prolonged drought in the local area. If so, these conditions are likely to continue to decline unless management pressures are adjusted. Bare soil often exceeds the desired 10% or less in most grasslands. The Tozer pasture has shown improvement over the years and while some areas remain in an upward trend, others are declining.

Brome dominated parklands occur in the Calf Allotment, particularly in the Salter Y area of the Tozer pasture. These areas are basically a monoculture of seeded smooth brome and timothy grass. These species often don't produce enough litter to protect the soil surface resulting in the A soil horizon to wash off. Past over-use has resulted in blowouts and soil loss. While these areas are showing signs of healing with bare ground slowly being filled in with plants and litter, there is still insufficient ground cover to prevent overland water flows and erosion. Given heavy use by livestock and prolonged drought conditions, little or no progress is expected in these areas and in some areas declines may occur.

Table 3.11 Primary resource concerns and key sites where concerns have been documented

Resource Concern	Key Sites
Poor conditions of springs, seeps, and riparian as	Hoppe Point, Dunham and Hinchman pastures, particularly Long Camp Spring and drainage below
Swales have poor plant species composition with little riparian vegetation and in some locations bare banks	Hinchman and Plantation pastures Swales in all pastures
Mountain grassland parks lack of native bunchgrasses, poor species composition and high percentage of bare ground	Hinchman and Plantation parklands
Brome dominated parks have continuous	Salter Y area

water flow patterns	

Glade Allotment

History- Actual use Animal Unit Months on the Glade Allotment have dropped from a high of 3,428 in the 1930's (no records for 60 years) to a low of about 2,376 in the late 1900's and early 2000's. It is currently operated with 2,755 AUMs. Season of use has changed from 229 days (4/15 – 11/30) in the 1940's to 139 days (6/14-10/30) in 2010. Today the allotment is operated under a season from 6/1-10/30 for 152 days.

A 1969 management plan in the historic files states little or no management has taken place until now. A 1987 document found in the files was the first mention of fencing Glade Lake for waterfowl nest protection. However, this was actually not completed until 2005 along with Beef Trail Reservoir. 1999 notes state that Glade Creek is trying to improve but still unstable, with ongoing downcutting and headcutting continuing.

Numerous vegetation treatments have occurred within the Glade Allotment. The following is a list of what has been decifered from historic files:

Treatment	Treatment Years	Total Estimate Acres
Timber Sales	1977	?
Pinyon/Juniper Chaining	1962-1965	600
Herbicide Brush Control	1956,1972	700
Hydromowed	2011	?
Wild Fire	1989	?
Seeding	1942-1948, 1989	654

Actual Use- The following Table shows the actual use within the Glade Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1906-1912	250	4/15-11/30	2495	Rotation
1913-1917	275	4/15-11/30	2744	Rotation
1918	500	4/15-11/30	4990	Rotation
1919-1920	600	4/16-11/30	5962	Rotation
1922	500	4/21-11/30	4860	Rotation
1924-1928	110	4/16-11/30	1093	Rotation
1929-1930	175	4/16-11/30	1740	Rotation
1931	250-290	4/16-11/30	2684	Rotation
1932-1937	210-240	4/16-11/30	2236	Rotation
1938	345	4/16-11/30	3428	Rotation
1990	266	6/1-10/30	1672	Rotation
1991	324	6/1-10/30	2738	Rotation
1992	420	6/1-10/30	2776	Rotation
2002	394	6/1-10/30	2261	Rotation
2007	438	6/1-10/26	2592	Rotation
2008	438	6/7-10/29	2492	Rotation
2009	434	6/14-10/24	2376	Rotation

Date	Livestock Number	Dates of Use	AUMs	Grazing System
2010	394	6/14-10/30	2297	Rotation
2011	458	6/10-10/30	2793	Rotation
2011	396	6/3-10/4	1963	Rotation

Range Condition and Trend- Rangeland Health Assessments were completed for the Glade Allotment in 2007. Two Parker 3-Step transects were established in 1956 and 1968 in the Glade and West Lower units respectively. One new Rooted Nested Frequency transect was established in the North Lake pasture in 2007. Repeat photography was established on this allotment with photos ranging as far back as 1913 and subsequent photos until 1999. Hydrologic monitoring evaluated 15 sites between 1998 and 2011.

Range condition for this allotment varies between pastures with no clear trend evident. Long-term transects in the Lower pasture shows mixed results, however given the new divide fence, improvement may need more time to become evident. The North Lake unit shows a decline in range health while the Glade pasture shows improvement. Hydrologic concerns continue to exist for South Lake, Five Pines and Beef Trail pastures. Specific problem areas include the following (3.12):

Springs, seeps and riparian areas are in poor condition throughout the allotment but particularly in the Lower, South Lake, Five Pines and Beef Trail units. While the Glade pasture shows improvement, willows are not returning along the streambank like they are just over the fence farther downstream. Some of these areas have lost riparian vegetation and are drying, given the compaction and trampling they have received probably exacerbated by the drought. Headcuts, pedestals and gullies are evident. Prolonged drought will continue to draw livestock to water sources intensifying the impacts.

Mountain shrublands and sagebrush shrublands have low ground cover, poor species diversity and poor age class diversity. This is particularly true on the Lower East and West pastures, the horse pasture and the North Lake pasture. Some areas of oak were treated historically in these areas creating openings that have now filled in with cheatgrass. The presence of this invasive species results in long-term trend declines. These areas lack litter and other forms of ground cover allowing the establishment of noxious weeds.

Table 3.12 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Poor conditions of springs, seeps, and riparian areas	Cow Canyon, Five Pines Canyon, Cow Spring and Canyon, Doe Spring, Glade Creek, all springs in Beef Pasture
Mountain shrublands and sagebrush shrublands has low ground cover, poor species diversity and poor age class diversity	Lower East and West Pastures; Horse pasture; North Lake pasture
The increase and spread of cheatgrass and other invasive species	Lower East and West pastures

Lone Mesa Allotment

History- Actual use Animal Unit Months for the Lone Mesa Allotment have dropped from a high of 855 in the early 1900's to a low of 434 today. A 1974 report states that there was "much controversy concerning estimated grazing capacity" for this allotment which is probably why the season of use has varied so greatly:

- 6/21-11/30 (223 days) original record (1946)
- 7/1-10/31 (123 days) in 1950's
- 5/16-10/31 (169 days) in the 1970's and 80's
- 5/15-8/15 (93 days) in the 1990's and early 2000's
- 5/21-10/11 (144 days) today

It was noted in 1969 that "the Lone Mesa C&H supports the largest deer herd on the Glade District". Critical deer winter range is on BLM administered lands below 6,500 feet elevation and within 1-2 miles of Disappointment Creek where it is estimated the average is 160 deer per sq. mile. The Spring Creek wild horse herd may be competing with big game on winter and spring ranges. This allotment is the summer range for these herds of big game.

This allotment has Mancos shale soils which is an issue for ground cover, plant establishment and often results in active erosion. It was also documented that this allotment has problems with poison (larkspur) which affects timing of cattle grazing, and also problems with musk and Canada thistle as noxious weeds. Photos from the 1990's of riparian areas show that they may be stabilizing, as willows and grass are establishing and banks are stabilizing.

Capacity studies in 1966 and 1972 estimated the allotment could support 1,976 AUMs. Monitoring during 1983 and 1984 estimated capacity at 1,782 AUMs. This allotment is currently permitted at 480 AUMs.

Numerous vegetation treatments have occurred within the Lone Mesa Allotment. The following is a list of what has been recorded in historic files:

Treatment	Treatment Years	Total Estimate Acres
Pinyon/Juniper Treatment	1968	1,500
Herbicide Oakbrush Control	1970	1,000
Herbicide Wyethia Control	1968, 1969	203
Prescribed Fire	1980's, 1990's, 1992	?

Actual Use- The following Table shows the actual use within the Lone Mesa Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1946	65	6/21-11/30	457	Unknown
1947	65	7/1-10/31	343	Unknown
1950	65	7/6-10/31	329	Unknown
1959	50	7/6-10/31	253	Unknown
1962	60	5/16-10/31	434	Unknown
1972	70	5/16-10/31	508	Unknown

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1972	70	5/16-10/31	508	Rotation
1981	79	5/16-10/30	552	Rotation
1984	94	5/16-10/30	623	Rotation
1988	235	5/26-10/30	1279	Rotation
1990	70	5/10-10/14	478	Rotation
1993	216	5/15-8/14	855	Rotation
2001	184	5/26-8/16	655	Rotation
2002	147	6/06-8/02	370	Rotation
2003	125	5/16-8/14	488	Rotation
2004	160	5/17-8/12	603	Rotation
2005	197	5/18-8/1	642	Rotation
2006	145	5/20-8/10	516	Rotation
2007	165	5/20-8/10	593	Rotation
2011	70	5/21-10/11	434	Rotation
2013	70	5/21-10/11	434	Rotation

Range Condition and Trend- One Parker 3-Step transect was established in 1967 in the Middle pasture and was re-read in 2008. Hydrologic monitoring evaluated 2 sites in 2013.

This allotment has improved over the years and continues to do so. The historic damage in the allotment was tremendous given the Mancos shale soils, but old scares are healing. The long-term trend transect in the Middle Unit shows a definite positive trend. Hydrologic function has also improved in the Thomas Mountain and Hunt Creek units. The vast numbers of vegetation treatments implemented on this allotment continue to provide benefits in improved ground cover and diversity in species. Specific problem areas are as follows (Table 3.13):

Springs, seeps and riparian areas have been in very poor condition and despite the fact they are improving, continue to be rated as Functioning At Risk. These are the drainages within the Hunt Creek and Thomas Mountain pastures where Mancos shale soils unravel under pressure. All streams have been documented in an upward trend with vigorous desirable riparian species, such as box elder, showing up in Hunt Creek and other drainages. The water table has dropped in these incised channels and while they will never return to the level they once were in a reasonable timeframe, they are forming a new riparian zone adjacent to the lowered streambed. Active erosion is expected to continue in deeply incised stream channels until equilibrium is reached and vegetation becomes established from top to bottom of channel banks.

Pinyon-juniper and sagebrush shrublands are improving in the Hunt Creek pasture but still lack sufficient litter and crusts to prevent continuous overland water flows. Groundcover protection in these stands is variable with some areas frequently containing bunchgrasses while other areas contain juniper litter. Some areas dominated by pinyon pine have encroached on old sagebrush parklands. These areas show a decline in ground cover. Biological crusts vary from being well developed to totally absent or at an early development stage depending on current and past use by livestock and big game. Variations in conditions are also associated with whether the site was previously chained and/or seeded or remain natural without past treatment.

Table 3.13 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Riparian areas improving but still Functioning At Risk	Hunt Creek Thomas Mountain Pasture
Pinyon-juniper and sagebrush shrublands improving but still lack sufficient litter and crusts to prevent continuous overland flows	Hunt Creek pasture
The increase and spread of cheatgrass, musk thistle, white top and Russian knapweed and other invasive species	Hunt Creek Pasture

Long Park Allotment

History- Actual use Animal Unit Months have varied widely on the Long Park Allotment since 1957. It has ranged from a high of 3,190 between 1957 and 1961 to a low of 719 in 2010. Current permitted AUMs are 2,793. Season of use has stayed relatively consistent since the 1950's with 147 days (6/1 – 10/25). This permit has been run with numbers below permitted since 2000 for personal and resource protection purposes. It is currently grazed at 38% of full permitted numbers but is slowly rising.

The Narraguinnep Research Natural Area (RNA) lies within the Long Park Allotment and was designated for its old growth ponderosa pine forest and canyon topography. The Forest Supervisor stated on 4/3/1961 that livestock grazing will not be permitted in the RNA. The new Forest Plan states that livestock grazing is restricted (may be used to meet desired conditions). Current management is to preclude livestock grazing from the RNA.

There was a statement in 1970 USFS notes saying there has been no intensive management of this allotment with a majority of the Long Park Allotment considered in poor to very poor condition in 1985. 1982 notes express concern for mule's ear coming in thick where overgrazed.

Things seemed to be turning around in the early 1990's with a 1991 report stating the Narraguinnep Canyon riparian area had improved with cottonwood regeneration, yellow willow, more hawthorne, and better bank stabilization. Young Thurber fescue was coming in on the uplands. One note stated that there had been a major improvement when compared to 1985.

Numerous vegetation treatments have occurred within the Long Park Allotment. The following is a list of what has been recorded in historic files:

Treatment	Treatment Years	Total Estimate Acres
Timber Harvest	1930's, 1983, 1984	961
Pinyon/Juniper Plowed	1968	250
Chaining of Oakbrush	1986	?
Brush Raked Oakbrush	1985	125

Treatment	Treatment Years	Total Estimate Acres
Herbicide Wyethia Control	1975, 1984	184
Prescribed Fire	1984	825
Seeding	1973, 1975, 1977, 1985	575

Actual Use- The following Table shows the actual use within the Long Park Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1957	500	6/1-10/25	3190	Rotation
1977	500	6/4-9/21	906	Rotation
1978	425	7/2-11/11	2347	Rotation
1979	422	7/11-11/20	2338	Rotation
1980	498	7/5-10/17	2261	Rotation
1981	494	6/15-11/9	3056	Rotation
1982	484	6/3-11/15	2705	Rotation
1983	450	7/3-11/8	2373	Rotation
1984	448	6/9-10/25	2459	Rotation
1985	440	6/3-11/2	2612	Rotation
1986	450	6/1-10/25	2504	Rotation
1987	488	6/2-10/24	2583	Rotation
1988	473	6/1-10/15	2682	Rotation
1989	490	6/4-10/30	2132	Rotation
1990	287	6/1-10/25	1063	Rotation
1991	370	6/1- 10/25	2313	Rotation
1992	405	6/2-10/25	2479	Rotation
1993	364	6/8-10/25	2281	Rotation
1994	440	6/1-10/25	2731	Rotation
1995	450	6/8-10/25	2571	Rotation
1996	400	6/1-10/24	2506	Rotation
1997	431	6/3- 10/25	2622	Rotation
1998	428	5/24-10/18	2685	Rotation
1999	450	5/30-10/24	2788	Rotation
2000	389	6/3-10/22	2431	Rotation
2001	406	6/16-10/20	2224	Rotation
2002	177	6/2-11/15	1282	Rotation
2003	177	6/2-9/12	791	Rotation
2004	173	6/2-11/7	1193	Rotation
2005	175	6/4-10/15	1018	Rotation
2006	175	6/3-10/25	1101	Rotation
2010	148	5/29-9/18	719	Rotation
2011	158	6/5-9/18	727	Rotation
2012	158	6/2-10/6	871	Rotation

Range Condition and Trend- Six Parker 3-Step transects were established starting in 1961 in the Narraguinnep and Lake pastures. Two Rooted Nested Frequency transects were established in the Lake Pasture in 1999. Hydrologic monitoring evaluated 3 sites.

The Long Park Allotment is definitely showing signs of improvement. Long-term transects located in the Narraguinnep and Lake units both show steady improvement. The positive trend

is undoubtedly the result of a reduction in stocking rate and the use of a full-time rider that helps properly distribute livestock. In some cases, this allotment was used in this analysis to show the potential of the Glade landscape while still being grazed. Specific problem areas are as follows (Table 3.14):

Most *Springs, seeps and riparian areas* show an upward trend when monitored for Properly Functioning Condition. While improvement is documented, some hydrologic features continue to rate as Functioning At Risk of which Narraguinnep Canyon is one. While willows are reestablishing in Narraguinnep Canyon, the channel remains unstable. The riparian area is dominated by lower statured grasses and forbs, possibly contributing to the site drying out. Pedestals and connected flow patterns are showing signs of recovery but they are not as far along as other meadows. Relatively recent soil loss and active pedestals exist.

Swales have downcut but are stabilized. Species composition is lacking but banks are beginning to vegetate. This is evident in Long Park and through-out the allotment. Evidence of improvement is that downcuts in swales are healing with edges being blunted and vegetating.

Mountain shrublands and sagebrush shrublands are improving but still have low ground cover, poor species diversity and poor age class diversity. Ormiston Point and Lake pastures are good examples of this. Ormiston Point has been chained and burned to increase ground cover and improve forage species. These areas have recovered from treatment but may need to be retreated in the future to maintain benefits. This area is used heavily by wintering big game and is the first pasture entered every spring when livestock go on the Forest. The Lake unit has improved since a long-term transect was first established in this unit. However, recent trend shows a decline, possibly a result of prolonged drought.

Table 3.14 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Riparian areas improving but still Functioning At Risk	Narraguinnep Canyon
Swales have downcut but are stabilized. Species composition is lacking but banks are beginning to vegetate	Long Park Swales in all pastures
Mountain shrublands and sagebrush shrublands improving but still has low ground cover, poor species diversity and poor age class diversity	Ormiston Point and Lake Pastures
The increase and spread of cheatgrass and other invasive species	Ormiston Point pasture

Mair Allotment

History- Based on historic records, it is clear that the boundary of the Mair Allotment used to include a larger area. What that area was and when it changed is unclear. Actual use Animal Unit Months for the Mair Allotment have dropped from a high of 6,512 in the early 1940's to a low of 4,287 today. Season of use has changed from 185 days (5/11– 11/15) in the 1940's to 152 days (6/1-10/30) today. Based on an extensive study conducted in 1993, the Mair Allotment has been running 100 head of cattle below permitted for resource protection showing actual use as 550 head from 6/1-10/30 for 3,628 AUMs.

The decline of the Mair Allotment was first recorded in the 1940's when records show the grass having disappeared from parks and soil not producing the forage that it could. It also talks about horses sinking 2-6 inches in many places (an indication that meadows have since dried). Notes from 1965 talk about the problem with mule's ear flourishing but they can't control it with herbicides because of the ponderosa pine/oakbrush overstory. A 1971 report states that of the 28,204 acres in the allotment, 955 are considered in fair condition with the remainder being poor. A 1980 range analysis found a majority of the allotment in poor condition. Plant species composition had changed from Arizona fescue/Mountain muhly bunchgrass to a bluegrass sod forming community. At this time, the primary concerns on this allotment were the Glade and Big Water units. A 1991 assessment states that range photos since 1963 show conditions have been about the same from then until now with Arizona fescue having declined or disappeared altogether. An observation recorded in a 1993 report expresses concern that livestock spend a disproportionate amount of time along creeks, in draws, and in meadows. Canada thistle and Russian knapweed are documented as problems in a 2001 reported.

Despite these concerns, a 1989 report documented coyote willow and tufted hairgrass reestablishing on lower Glade Creek. Wolf Den Canyon riparian area was deemed in fair condition with cottonwoods, willow and hawthorne sprouts in a 2001 report.

Numerous vegetation treatments have occurred within the Mair Allotment. The following is a list of what has been recorded from historic files:

Treatment	Treatment Years	Total Estimate Acres
Timber Sales	1930,1966, 1977,1978, 1981	Entire Allotment
Pine Plantations	1966 (estimated), 1977,1978, 1981	?
Rollerchop Oakbrush	1978	?

Actual Use- The following Table shows the actual use within the Mair Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1941	760	5/11-11/15	6512	Rotation
1944	725	5/11-11/15	6170	Rotation
1949	645	6/1-10/31	4257	Rotation
1951	450	6/1-10/31	2970	Rotation
1952	500	6/1-10/31	3300	Rotation
1967	500	6/1-10/31	3960	Rotation
1970	500	6/1-10/31	5260	Rotation
1973	500	6/8-10/31	4404	Rotation

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1974	650	6/8-10/30	4673	Rotation
1980	700	6/15-10/31	4335	Rotation
1991	650	6/15-10/31	4335	Rotation
1998	656	6/1-10/30	3903	Rotation
2000	550	6/1-10/30	4368	Rotation
2002	396	6/1-9/30	2096	Rotation
2003	180	6/1-10/31	1430	Rotation
2004	450	6/1-10/30	2970	Rotation
2008	545	6/5-10/30	3500	Rotation
2012	512	6/1-10/6	2845	Rotation

Range Condition and Trend- Use mapping occurred on the Mair Allotment between 1987 and 1989. Rangeland Health Assessments were completed for the Mair Allotment in 2007. Three Parker 3-Step transects were established starting in 1963 in the Big Water and Wolf Den pastures. Hydrologic monitoring evaluated 25 sites between 1993 and 2011.

Results of Long-term trend transects combined with hydrologic function on the Mair Allotment are mixed. Pole Canyon, Wolf Den and Glade pastures generally show improvement. Wild Bill pasture has definitely declined. Big Water pasture shows a slight decline. Specific problem areas are as follows (Table 3.15):

Most s*prings, seeps and riparian areas* on this allotment generally show an upward trend when monitored for Properly Functioning Condition, however, all those inventoried in the Wild Bill unit were in poor and declining condition. Glade Creek has improved with riparian vegetation reestablishing including willows, hawthorn, rushes and carex now present. Based on interdisciplinary team monitoring, springs and reservoirs range in condition from Properly Functioning Condition to Functioning At Risk; Some cattle impacts are evident with compaction.

Swales have poor plant species composition with little riparian vegetation and in some locations bare banks. This is evident at parklands throughout the allotment, but particularly in the Big Water pasture. The Big Water unit, particularly Big Water park, is grazed season-long given the stray cattle that find their way back there no matter what pasture they are in. Many of the meadows in the Big Water pasture appear to have held shallow water or at least saturated soils at one time. Several meadows may have been seasonal wetlands in the past. Now they have shallow rooted plant species that don't hold soil moisture and provide very little litter to provide ground shade and cover.

Mountain shrublands lack ground cover including litter, crusts, and mat-forming plants to minimize overland flow connections. This is most evident in the Pole Canyon unit where soils are shallow and bare ground dominates. Over-grazing and trampling in this unit has occurred and if continued, particularly given drought conditions, will promote the spread of cheatgrass and other invasive undesirable species.

Mountain grassland condition is poor with a lack of native bunchgrasses, dominated by poor vegetation species and a high percentage of bare ground. Pole Canyon and

Big Water pastures display this condition, primarily due to shallow rocky soils. Meadows are dominated by Kentucky bluegrass, a shallow rooted invasive species that produces very little litter. Livestock tend to congregate in these areas which receive a disproportionate amount of use (60-70%). Livestock ponds have been placed in grassland parks which exasperates the problem of over-use by livestock.

Table 3.15 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Poor conditions of springs, seeps, and riparian areas	Fader Spring, Cottonwood Spring, Chicken Aspen Creek, Little Bill, and Wild Bill #6 reservoirs
Swales have poor plant species composition with little riparian vegetation and in some locations bare banks	Big Water pasture Other wet meadows
Mountain shrublands lack ground cover including litter, crusts, and mat-formation to minimize overland flow connections	Pole Canyon parklands
Mountain grassland parks lack of native bunchgrasses, poor species composition and high percentage of bare ground	Pole Canyon pasture Big Water pasture
The increase and spread of cheatgrass, musk thistle, white top and Russian knapweed and other invasive species	Pole Canyon pasture

Sagehen Allotment

History- This allotment is fairly new given it was created from lands surrounding McPhee Reservoir when it was built in 1987. No documentation has been found to indicate the Sagehen Allotment has ever been managed under a Term Grazing Permit. This allotment contains two units: Sagehen pasture which is southeast of the dam and the Lone Dome pasture which consists of the Dolores River corridor below the dam.

A well-established stock trail exists that runs across the west boundary of the Sagehen pasture down to the dam then up the other side to the north. The stock driveway was constructed in 1985 by the Bureau of Reclamation to provide access after construction of the reservoir blocked previous stockways. It is currently used both in the spring and in the fall by at least six livestock operators.

A fence once surrounded the allotment as a result of fencing the area around McPhee reservoir. This fence, however, has not been maintained unless necessary for the management of neighboring allotments. Two sets of corrals exist, one on the south side of the Sagehen unit and one below the dam in the Lone Dome unit.

7,148 acres out of 27,081 acres within the Sagehen Allotment are considered suitable range. Acreage occupied by McPhee Reservoir, Dolores River, and the CPW's Lone Dome Wildlife Management area exist within the Sagehen Allotment boundary.

The 2001 Montelores Habitat Partnership Project Plan states that Sagehen pasture consists of 3,000 acres of which about 50% has been seeded to a pasture mix of wheatgrasses and smooth brome. The other half is comprised of a mountain shrub community and a sagebrush/wheatgrass community. About 3,000 acres within the Sagehen pasture is suitable for supporting livestock. Approximately 2,500 of 4,000 acres of the Lone Dome pasture is suitable for supporting livestock. Current vegetation consists of cottonwood/willow interspersed with old hay meadows. The Colorado Department of Parks and Wildlife owns approximately 1,600 acres within the Lone Dome area. The area has been grazed periodically in the past either as relief for pastures above the canyon, trespass, or for vegetation manipulation. No permitted grazing has taken place since 1988.

Desert bighorn sheep were reintroduced into the Dolores River canyon in 1986. The sheep typically stay below the rim of the Forest and downstream of Bradfield Bridge on BLM administered lands where habitat is most appropriate for them.

Problems do exist on this allotment with Canada thistle, musk thistle, yellow toadflax, and bindweed. Weed control has been documented on this allotment since 2001.

Numerous vegetation treatments have occurred within the Sagehen Allotment. The following is a list of what has been decifered from historic files:

Treatment	Treatment Years	Total Estimate Acres
Seeding of Sagehen Pasture	?	3,000
Contour Furrowing of Sagehen Pasture	?	100
Prescribed Fire in Lone Dome Pasture	1993 & 1994	?

Actual Use- No actual use has been recorded for this allotment although we know it has occurred seasonally through authorized use of the stock driveway as well as incidental trespass.

Range Condition and Trend- Since the Sagehen Allotment has not been administered under a Term Grazing Permit, very little monitoring has taken place. No long-term trend transects have been established. Hydrologic monitoring evaluated 7 sites between 1993 and 2004. Specific problem areas are as follows (Table 3.16):

The Sagehen Allotment area was established for big game and archaeological resources as mitigation for the construction of McPhee Reservoir. Because much of it was private land at one time, remnant signs of private ownership remain such as old corrals, stock ponds and seeding of nonnative forage species. The two primary units of this allotment have been managed differently and therefore exhibit different conditions.

The Sagehen unit on the mesa west of McPhee Reservoir has largely been used for dryland grazing in the past. It was seeded predominantly with nonnative wheat and brome grass species and exhibits many of the same traits (and concerns) as the brome parkland vegetation type does. These *seeded parklands* lack species diversity, native vegetation, and sufficient ground cover.

The Lone Dome unit below the McPhee dam consists primarily of a riparian area with pockets of historically-farmed fields. At one time the river's floodplain consisted of a

cottonwood gallery dominated by a variety of riparian trees and shrubs. Once river flows were regulated and farms were established, the floodplain dried and was cleared for hay production. The Dolores River is rated as Functioning At Risk with sections no longer having access to the floodplain and the system laterally unstable.

Table 3.16 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Brome dominated parks which in this case is more dominated by seeded wheatgrasses, lack species diversity and native vegetation	Sagehen Park
The increase and spread of cheatgrass, musk thistle, knapweed, tamarisk and other invasive species	Saghen Park, Below McPhee dam, and areas surrounding reservoir and its tributaries

Salter Allotment

History- Actual use Animal Unit Months have dropped in the Salter Allotment has ranged from a high of 9,552 in the early 1940's to a low of 2,370 in the 1980's and is currently around 2,643. Season of use has changed from 183 days (5/16– 11/15) in the 1940's to 147 days (6/1-10/25) in the 1960's -1970's and is 152 days (6/1-10/30) today.

A USFS record from 1947 shows the range was depleted with little considered in good condition and most rated low/fair. However, conditions were described in USFS notes as improving in 1953 with trends up. The Salter Allotment was chosen to be a demonstration allotment on the Glade District that same year. A statement in a 1961 report says "It is ok to consider Long Park and Salter two separate allotments" which implies they were one allotment prior to that date. 1978 documents talk about larkspur poison as an issue in Ferris pasture and other units.

Although discussed as early as 1987, a decision was made in 2005 to protect specific wetlands within the Salter Allotment for water quality and nesting waterfowl. While Dry Lake, Cabin and Ferris reservoirs were advised for livestock exclusion, only Ferris was actually fenced.

Numerous vegetation treatments have occurred within the Salter Allotment. The following is a list of what has been recorded from historic files:

Treatment	Treatment Years	Total Estimate Acres
Pine Plantation	1964	480
Reseeding	1949	368

Actual Use- The following Table shows the actual use within the Salter Allotment over the years:

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1941	1195	5/16-11/15	9552	Rotation
1945	1148	6/1-11/15	8131	Rotation
1947	1220	6/1-10/25	7261	Rotation
1949	877	6/1-10/25	5331	Rotation
1950	935	6/1-10/25	6003	Rotation
1953	921	6/1-10/25	5220	Rotation

Date	Livestock Number	Dates of Use	AUMs	Grazing System
1960	935	6/1-10/25	5965	Rotation
1961	441	6/1-10/25	2814	Rotation
1971	441	6/1-10/25	2814	Rotation
1973	435	6/1-10/25	2775	Rotation
1978	435	6/14-11/18	2893	Rotation
1979	445	6/1-10/25	2780	Rotation
1982	452	6/16-11/15	2371	Rotation
1986	454	7/3-11/15	3172	Rotation
1989	454	6/5-10/25	2550	Rotation
1993	450	6/11-10/30	2772	Rotation
1995	420	6/8-10/31	2609	Rotation
1997	425	6/8-11/4	2714	Rotation
2005	420	6/1-10/30	2789	Rotation
2012	420	6/1-10/30	2789	Rotation

Range Condition and Trend- Use mapping on the Salter Allotment shows only a portion of suitable range has been used to any significant extent, and that portion repeatedly exceeds utilization criteria. The pattern of use mapped in 2012 on the Salter pasture matches the same pattern of use mapped in 2001. Two Parker 3-Step transects were established in 1961 and 1968 on the Salter and Middle pastures respectively. Rooted Nested Frequency transects were established in the pastures listed above in 2007 and 2008. Hydrologic monitoring evaluated 6 sites between 2001 and 2013.

Long-term transects for the Salter Allotment show a general decline in range health. Use mapping has shown poor livestock distribution over the past 20 years resulting in parklands receiving a disproportionate amount of use. While the long-term transect for the Salter unit shows mixed results, the middle unit trend is stable at an undesirable state. Soils have improved on some sites and not on others while vegetation condition remains poor to very poor. Specific problem areas are as follows (Table 3.17):

Most *springs, seeps and riparian areas* on this allotment are in poor condition given heavy use by livestock which seem to congregate and remain at these structures. Hydrologic features in Willow Draw and Upper Salter are Functioning At Risk. Those in the Salter unit have mixed conditions depending on whether work has been performed to improve them or not.

Swales have poor plant species composition with little riparian vegetation and in some locations bare banks. This is evident at parklands throughout the allotment, but particularly in the Salter, Upper Salter and Lower Salter pastures. Parklands now have shallow rooted plant species that don't hold soil moisture and provide very little litter to provide ground shade and cover. As a result, swales often have bare banks and are dry without riparian species present. The placement of stock ponds in these areas and the associated disproportionate use by livestock exasperates conditions in parklands and swales.

Mountain grassland condition is poor with a lack of native bunchgrasses, dominated by poor vegetation species and a high percentage of bare ground. This is evident in all

pastures. Dominant livestock trails with bare ground are also evident as livestock travel from one stock pond to the other. As stated above under swales, parklands now have shallow rooted plant species that don't hold soil moisture and provide very little litter to provide ground shade and cover. Disproportionate use of parklands by livestock exasperates conditions. A fence contrast can be made between the Salter and Long Park allotments which lie next to each other to point out the potential of this allotment. Mountain muhlenbergia, a native desirable bunchgrass, is evident on the Long Park side of the fence but absent from the Salter side. Historic notes show that Salter parklands used to be dominated by Thurber fescue but have declined over time.

Mountain shrublands and sagebrush shrublands have low ground cover, poor species diversity and poor age class diversity. This is primarily evident in the Ferris and Willow Draw pastures. Vegetation treatments have occurred in the Ferris unit to increase ground cover and improve forage species. These areas have recovered from treatment but may need to be retreated in the future to maintain benefits. This area is used heavily by wintering big game and has been the first pasture entered every spring when livestock go on the Forest.

Table 3.17 Primary resource concerns and key sites where those concerns have been documented

Resource Concern	Key Sites
Poor conditions of springs, seeps, and riparian areas	Cabin Reservoir, Glade Lake, Glade Point Reservoir, Beef , Ferris Reservoir, and Dry Lake (all water bodies designated as High Quality Water and/or Regional Wetland) in addition to Drake Reservoir
Swales have poor plant species composition with little riparian vegetation and in some locations bare banks	Salter, Upper Salter, and Lower Salter pastures
Mountain grassland parks lack of native bunchgrasses, poor species composition and high percentage of bare ground	All pastures Major trail(s) between Ferris and Cabin reservoirs
Mountain shrublands and sagebrush shrublands improving but still has low ground cover, poor species diversity and poor age class diversity	Ferris and Willow Draw pastures

3.9.3 Desired Conditions

Resource Concern	Desired Condition
Poor conditions of springs, seeps, and riparian areas	Maintain water sources at Properly Functioning Condition (PFC) or moving towards PFC **(**PFC is a methodology for assessing the physical functioning of riparian and wetland areas)
Lack of litter, crusts, and mat-formation to	Maintain sufficient residual cover in the form

Resource Concern	Desired Condition
minimize overland flow connections	of plants and litter to reduce bare ground and break up continuous overland flow patterns
Mountain grassland parks lack of native bunchgrasses, poor species composition and high percentage of bare ground	Maintain sufficient residual cover in the form of plants and litter to reduce bare ground, hold more soil moisture and increase native bunchgrasses Native bunchgrass clumps are present and have the highest relative dominance and density of any vegetation
The increase and spread of cheatgrass, musk thistle, white top and Russian knapweed and other invasive species	Maintain sufficient residual cover in the form of plants and litter to reduce bare ground, increase plant density and reduce bare ground for weedy species to become established

3.9.4 Environmental Consequences

The effects of domestic livestock presence include: removal and consumption of rangeland plants, drinking water from tanks and streams, and treading across the landscape. Major impacts from the following alternatives are largely described in other sections of this DEIS. For example, effects to vegetation are described in the Vegetation section. Effects to streams, seeps, springs, ponds and other hydrologic features are described in the Watershed and Water Quality section. Economic impacts to the grazing permittee are analyzed in the Socio-Economics section. Therefore, the following analysis focuses on other potential impacts and leaves lengthy discussions on the above topics for other sections.

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

This alternative would permit 0 AUMs of forage to livestock grazing permittees to graze their livestock.

Since aspen browsing by livestock is an incidental use, removal of permitted domestic livestock would eliminate a portion of this impact on sprouts and saplings. Most stands would continue to be browsed by big game and other wildlife.

Water would not be used or consumed by permitted livestock on the Glade landscape, whether that drinking takes place directly from a stream, or out of a tank or pond. Given no livestock would be permitted in this alternative for the Glade landscape, it is estimated that 0 acre feet of water per year would be removed directly from the water system. Where pipes from spring developments have fallen into disrepair, altered water flows and less than desirable riparian conditions would continue to exist until the Forest Service reclaimed the sites. Reclamation would occur through a separate NEPA analysis if needed.

This alternative would diminish or eliminate the need for livestock facilities including cow camps, spring developments, ponds, corrals, fencing, and the continued maintenance of such structures. Most range improvements currently in existence on the Glade landscape would be abandoned and removed as time and budget allowed. Subsequent decisions would need to be made regarding retention of any improvement for other resource needs. If any improvements

are retained, funding would need to be secured for this activity since they are currently maintained by the livestock grazing permittee. Loss of range betterment fund revenue would occur since it comes from livestock grazing fees. These funds, however, are required to be put back into livestock facilities on the Forest and with no permitted livestock in the Glade area, the need would be eliminated.

Some need for stock driveways would continue given private land grazing above the Forest in the Ground hog area. However, driveway use would decline given the loss of public land permittees in the area. The use of livestock hauling trucks on system roads would likely decline except for those that require them to access private land.

No user conflicts with livestock such as feces on bike trails, livestock intrusions into recreational camps, and livestock disturbance of hunters would continue. Livestock damage or loss due to motor vehicle accidents would not occur with permitted livestock on the Glade landscape. Forage once removed by permitted livestock would be available for big game and other wildlife use.

Fire suppression activity may need to increase with an increase in forest fuels readily able to burn. Heavier grass loads results in greater amounts of litter which can become decadent and cured, increasing fire hazard. Should a fire get started, these fine fuels could carry a fire farther faster resulting in larger more intense fires.

The local community is highly dependent on Forest Service administered lands for many products, of which livestock forage is one. Removing permitted livestock grazing from the Glade would reduce community dependence on local public lands and would have local economic and social effects as detailed in that section.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

This alternative would continue to initially authorize 19,568 AUMs of forage to livestock grazing permittees to graze their livestock.

Since aspen browsing by livestock is an incidental use, permitted domestic livestock would continue current impacts on saplings. This use would be compounded with current browsing by big game and other wildlife.

Water would continue to be used or consumed by permitted livestock on the Glade landscape, whether that includes drinking directly from a stream, or out of a tank or reservoir. Given the permitted number of livestock and season of use, it is estimated that Alternative B would remove 24.6 acre feet of water per year from the water system. Where pipes from spring developments have fallen into disrepair, it is the permittee's responsibility to restore proper functionality and resource protection.

This alternative would continue the need for livestock facilities including cow camps, spring developments, ponds, corrals, fencing, and the continued maintenance of such structures. Most range improvements currently in existence on the Glade landscape would be maintained by livestock grazing permittees. There would be no loss of range betterment revenue tied to permit fees associated with Glade livestock permittees.

The need for stock driveways would continue at current levels. The use of livestock hauling trucks on system roads would likely remain the same as well.

User conflicts with livestock that currently exist would likely continue. Livestock damage or loss due to motor vehicles would continue. Forage competition between livestock and big game and other wildlife would continue at current levels.

Fire suppression activity would still be needed, however livestock removal of grass and other vegetation may decrease forest fuels and reduce fire hazards. Livestock use of grass, as currently managed, removes most litter in parklands possibly decreasing fire hazards in that vegetation type. Should a fire get started, the removal of fine fuels by livestock may decrease fast moving large or intense fires.

Local livestock permittees would continue their dependence on local National Forest lands and the forage produced at the same level as currently experienced.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

Each allotment would be permitted for specific dates and livestock numbers, (total permitted AUMs). Should long-term trend data show an allotment is functioning at desired conditions or clearly moving towards desired conditions, AUMs may be increased up to 20% on years where above average forage is produced. Utilization of this "extra" forage would not impact the condition of the allotment. Therefore, a range of dates and AUMs is provided for the Proposed Action.

Permitted livestock grazing would occur between May 10 and November 10 for no more than 21,628 AUMs within the defined project area including the defined constraints. These dates represent the maximum range of time grazing could occur under a Term Grazing Permit and the AUMs represent the maximum possible use. Actual permitted AUMs would average 18,023 AUMs.

Since aspen browsing by livestock is an incidental use, permitted domestic livestock would continue current impacts on saplings. This use would be compounded with current browsing by big game and other wildlife.

Water would continue to be used or consumed by permitted livestock on the Glade landscape, whether that includes drinking directly from a stream, or out of a tank or reservoir. Given the permitted number of livestock and season of use, it is estimated that Alternative C would remove 22.6 acre feet of water per year from the water system. Where pipes from spring developments have fallen into disrepair, it is the permittee's responsibility to restore proper functionality and resource protection as a requirement of their term grazing permits. This alternative differs from Alternative B by establishing a timeline for proper water development repair.

This alternative would continue the need for livestock facilities including cow camps, spring developments, ponds, corrals, fencing, and the continued maintenance of such structures. Most range improvements currently in existence on the Glade landscape would be maintained by livestock grazing permittees. There would be a minor loss of range betterment revenue tied to permit fees given probable and potential reductions in AUMs, however, the reduced use by livestock would also reduce impacts to structures. Therefore, these impacts are negligible.

The need for stock driveways would continue at approximate current levels. The use of livestock hauling trucks on system roads would likely remain the same as well.

User conflicts with livestock that currently exist would continue although they may be reduced through improved management. Livestock damage or loss due to motor vehicle accidents would continue. Forage competition between livestock and big game and other wildlife would continue at slightly less levels in some areas where better management is applied.

Fire suppression activity would still be needed, however livestock removal of grasses and other vegetation would decrease forest fuels and reduce fire hazards. Although an objective of this alternative is to increase ground cover, litter would likely not increase to the level of becoming decadent and cured and increasing fire hazard. The added ground cover should increase soil moisture. Should a fire get started, the removal of fine fuels by livestock would likely prevent the fire from moving faster or being as large or intense as those described under Alternative A and similar to those described in Alternative B.

A small amount of additional pressure for private land grazing could result from this alternative, particularly for those permittees that need to find pasture when a unit is planned for rest one out of three years or if they are reduced time on forest lands in order to manage for allowable use. The degree to which a permittee has to find additional private land pasture to sustain their existing herd is mostly dependent on the permittee's willingness and/or ability to increase their intensity of management. Should poor distribution of livestock continue and mapping show that only a portion of suitable range is being used, this alternative would reduce the time livestock are authorized on forest lands proportionate to the suitable acres being used. Once 2 out of 3 years shows poor livestock distribution resulting in proper use criteria being exceeded, reductions will begin. For example, if a unit shows only 50% of estimated grazing capacity of suitable range is being used by livestock, then only 50% of the time to graze that unit would be allowed.

Local livestock permittees would continue their dependence on local public lands and the forage produced at a slightly less level than currently experienced.

The trade-off for this alternative for several permittees is they perform a greater intensity of management or they receive a reduction in time for grazing. Greater intensity is defined for each allotment where it is required. Examples include: hauling water, providing mineral supplements for better distribution, improvement of existing springs, seeps and ponds, closure of water sources where they are creating unacceptable livestock impacts in riparian areas, dividing pastures, water-loting (fencing) water sources to better distribute livestock, construction of gap fences to prevent season-long-grazing in some pastures, rotating or resting first pastures so they are not grazed at the same time every year and more. This alternative also promotes the maintenance of existing vegetation treatments where funding is available.

Alternative C meets the purpose and need of improving current vegetation and soil conditions while maintaining viable livestock operations by authorizing livestock grazing on the Glade landscape.

3.10 Recreation/Travel Management

3.10.1 Affected Environment

Recreation Activities by Area

Sage Hen: Located north of Montezuma County Road (MCR) X this area is currently designated for non-motorized day-use only recreation. There is an informal (user-created) single-track trail system which follows the rim and provides loop opportunities. This trail is used by mountain bikes, with occasional use by horseback riders, who often ride cross-country. Administrative roads are accessed by a closed/locked gate. Off Highway Vehicles (OHV) illegally access from either MCR X or from the old road at the northern tip of Sage Hen near McPhee Dam. South of MCR X, the area provides day-use access to the reservoir on various short system roads; during summer months fishing and general day use south of MCR X is popular.

Lone Dome: Located from approximately Bradfield Bridge to McPhee Dam, Forest Road (FR) 504 parallels the Dolores River for approximately 10 miles. This area contains National Forest lands interspersed with Colorado Parks and Wildlife and private land. Forest lands include two Forest Service Campgrounds (Cabin Canyon and Ferris Canyon), both of which are under-utilized during the summer months. Metaska Picnic Area, immediately downstream from the McPhee Dam was decommissioned in 2008.

McPhee Reservoir: This area is managed for water-based recreation with developed facilities at Dry Canyon.

Salter Y/Black Snag/Glade: Recreation activities include hunting, dispersed camping, and OHV use primarily during general the rifle seasons running from the beginning of October thru mid-November. Many hunters deem this particular area as their destination particularly during the 3rd and 4th hunting seasons.

During summer months, OHV use is popular on many of the existing system and non-system roads. Many recreationists, and especially hunters, enjoy the use of OHVs. No designated trail system exists throughout this area so motorized use is restricted to roads. Since the Glade is generally flat with large open parklands, it is often difficult to keep motorized vehicles restricted to designated roads. Various roads also provide access to BLM lands north of the Glade.

Uses and How they Relate to Livestock Grazing

Hunting: The highest concentration of hunter use occurs during rifle seasons, but muzzleloader and archery is increasing in popularity on the Glade. Cattle remain on the allotment through October so there is an overlap between cattle presence and hunting activity from the end of August through the end of October. Cattle can detract from hunter experience because elk often tend to move away from livestock herds. Several hunters call-ahead to determine livestock rotations, planning their hunts around them. Conversely, hunting activity can negatively impact livestock operations through gates left open or livestock harassed, and occasionally through vandalism

Outfitter Guides: Outfitter guides that operate in this area include guided backpacking trips for at-risk youth and camping/guiding services for hunters. The backpacking trips are unaffected by the presence of cattle, although they over-lap during summer months. The hunting outfitter that operates on the Glade requests information each year about grazing rotation schedules then plans his operations accordingly.

Dispersed Camping: Dispersed camping is very low during summer months but increases during September through November. The highest number of dispersed campers is associated with fall rifle seasons. Dispersed campers may choose an alternate site if cattle are present. There are many dispersed camping opportunities across the Glade so finding an alternate site is not difficult. Campers may 'push' cattle away from their campsite locations. To date, issues with campers blocking water sources for cattle has not occurred.

Roads and Gates: Many forest roads have cattleguards across them where pasture or allotment fence lines cross. Cattleguards allow livestock to remain in designated pastures while unencumbering driving on the road. There are also a number of places where fences cross forest roads using wire gates rather than cattleguards to keep livestock within designated pastures. Conflicts arise when drivers of vehicles open gates and do not close them. Cattle can end up in several pastures often returning to pastures that have already been grazed and in need of rest, or scattering into several pastures where permittees spend considerable time gathering. While recent travel management decisions have reduced the overall miles of roads that cross fence lines on the Glade landscape, road densities still average approximately 2 miles per square mile. The 2012 Boggy Glade Travel Management decision approved a new OHV trail which includes trail cattle guards at all fence crossings.

Road Access for Range Management: Most cattle are brought onto the Glade landscape each year by driving stock trailers on main roads. Several livestock herds are trailed on and off the Forest. The current road system facilitates livestock management practices by providing frequent access for grazing permittees to transport livestock, haul fence material, and haul salt or mineral supplement. Annual Operating Instructions are used as authorization for grazing permittees to access closed routes or drive cross-country in order to access and maintain range improvements such as fences and reservoirs. Heavy equipment used to construct or clean reservoirs can be "walked" into an area from a nearby open road so there is not a need for roads to lead to every reservoir. Problems can develop when permittees use these privileges too freely and permittee-created trails begin to develop. Sometimes the general public assumes when they see someone driving cross-country that they can drive cross-country too, despite the fact the permittee has specific authorization.

Scenery: The scenery of the Glade landscape can be affected by the presence of cattle or the presence of range improvements. Fences are a common sight across the Glade and tend to blend into the working forest setting the public has come to expect in these areas. Recreationists have seen cattle on the Glade landscape for decades and cattle are considered by many as a positive attribute to the forest setting. Other recreationists feel that cattle detract from natural forest settings. Because there are relatively low numbers of summer time scenic drivers and dispersed campers, the presence of cattle is not a major concern for scenic quality. In fact, some forest users are happy to see cattle on open ranges as they add a true

symbol of the 'wild' west to the local scenery. It is not uncommon to see people photographing a local permittee as he rounds up or herds his livestock across public lands.

Ponds and spring developments provide water for wildlife as well as cattle. Ponds and springs often have a greater diversity of vegetation than surrounding uplands and therefore provide for diverse scenery and wildlife viewing. Although ponds can add to the scenery of an area, cattle tend to congregate around water sources often impacting their beauty and functionality. Cattle that are allowed to camp out at water sources for long periods of time can create bare ground and localized areas of high insect infestation which detracts from the natural forest setting and the experience of recreationists.

Scenery is also affected by the health of the rangelands. Diverse, healthy rangelands that include native species can contribute to scenery. Bare ground generally detracts from scenery. At the same time, unhealthy rangelands with flowering annuals and flowering weeds might also look attractive.

3.10.2 Environmental Consequences

Direct and Indirect Effects of Alternative A- No Permitted Livestock Grazing

There would be no effect to recreation opportunities or access under this alternative. Current recreation activities would likely continue. Hunters and outfitter guides related to hunting may appreciate hunting without the presence of cattle or without having to manage around them. Dispersed campers would not be displaced by cattle at any location.

Public views on scenery vary, while some people may appreciate a forest scene with no cattle present, other's may feel the lack of cattle detracts from the scenery. Open parks and meadows would be expected to have more vegetation, less bare ground, and a greater diversity of plant species eventually which could improve scenery. At the same time, if ponds are abandoned and eventually removed or fail to hold water, this would result in less riparian vegetation and reduced wildlife viewing opportunities. Fences would no longer be a part of the forest setting in these areas. Again, some people would appreciate the lack of fences while others may miss seeing them.

The problem of gates left open becomes a moot point under this alternative. Recreationists would no longer need to stop to open and close wire gates. The need for cattleguards diminishes under this alternative which would lessen road and trail maintenance costs as compared to Alternatives B and C.

Direct and Indirect Effects of Alternative B- Current Permitted Grazing and Management

There would be no effect to recreation access under this alternative. Current recreation activities would likely continue. Effects that occur today would likely continue. Dispersed campers could be displaced by livestock to alternate sites within the area. Range structures such as fences and ponds would remain on the landscape.

Hunters may encounter cattle while hunting from late August through October. To date, hunters have not readily complained about the presence of cattle on the Glade area.

Outfitter guide operations have been successfully operating under current management. Backpacking and hunter camp services would continue. The outfitter that provides hunter camps would need to continue coordinating his business with information provided on pasture rotations.

Some level of impact to livestock grazing permittee's operations is anticipated from recreationists with hunters leaving gates open, especially during late summer and early fall. Successful range management depends on using pastures at set times and if cattle move through a gate left open this requires additional permittee effort to move cattle back to the appropriate pasture.

At the same time, the recreating public would be affected because of the need to stop, open a gate, drive through and close the gate again. It is understood by recreationists that the working forest landscape of the Glade area requires fences to be opened and closed. The installation of cattleguards can help alleviate issues where gates are repeatedly left open. This, however, requires more expense and maintenance than in Alternative A. Cattleguard installation would be dependent on FS funding and staff.

Another issue can occur when cattleguards fill with dirt and cattle walk over the cattleguard. Cleaning cattleguards is a maintenance task for the FS. The maintenance of cattleguards often cannot keep up with the need.

Under this Alternative, cattle tend to congregate around ponds and in open parklands. Many cattle, congregate for long periods of time near ponds detracting from the scenery by creating areas of bare ground. This effect is expected to continue under this alternative.

A reduction in bare ground and improvement in plant cover and native species diversity could improve scenery. These improvements would not occur or would occur more slowly under this alternative than would be expected under Alternative A or Alternative C. Ponds would be maintained and contribute to diversity of vegetation and wildlife viewing opportunities but this would not occur as soon as with the other alternatives. Swales would continue to appear similar to current conditions. Fences would remain a part of the forest setting in these areas.

Direct and Indirect Effects of Alternative C- Proposed Action with Adaptive Management

This alternative would maintain livestock grazing on the Glade landscape during similar timeframes as Alternative B. Alternative C would improve distribution of livestock across a pasture. Cattle may spend less time in parklands and more time grazing the pine/oak areas under this alternative. As a result, over time there would be less bare ground, more native grass species quality and quantity in parklands, and more healthy water sources such as ponds and springs.

Similar to alternatives A and B, there would be no effect to recreation access under Alternative C. Current recreation activities would likely continue. Effects that occur today would likely continue. Dispersed campers could be displaced to alternate sites within the area similar to Alternative B.

Hunters may be more likely to encounter groups of cattle within the pine/oak areas than under Alternative B. If cattle are more evenly distributed across a pasture the chance of encounters is

also spread out. To date, hunters have not readily complained about the presence of livestock on the Glade landscape.

Effects to outfitter guides are similar to Alternative B.

The effects to livestock grazing operations from gates left open is the same as Alternative B because the location of roads and fences is the same.

Under this Alternative, cattle would continue to congregate around ponds but would be less likely to stay for long periods of time. The same is true in parklands. The result would be a reduction in bare ground and improved plant cover and native species diversity; both of which would improve scenery. These improvements are expected to occur faster than Alternative B but slower than Alternative A.

Ponds would be maintained within defined timelines and contributing to the diversity of vegetation and wildlife viewing opportunities. This would occur more rapidly than Alternative B but slower than Alternative A. Swales would show additional riparian plant species and shrubs adding to the visual diversity of many parklands. More birds and other species may been seen in swale areas for wildlife viewing. Fences would remain a part of the forest setting in these areas similar to Alternative B.

3.11 Cumulative Effects and Natural Disturbance Processes

The purpose of this cumulative effects analysis is to ensure that environmental information related to cumulative effects is available to public officials and citizens before decisions are made and before actions are taken. Identifying potential cumulative effects involves addressing past, present, and reasonably foreseeable future actions that may individually be minor but collectively be significant. To be considered, the effect must add to effects that will occur from project implementation.

The Glade landscape has been a focal area for a variety of management strategies, techniques, and directions over many years. Looking at past management helps to define what we see across the Glade today (existing condition). Cumulative effects consider environmental, social and economic effects in the context of our specific project; they can be either positive or negative; they include both indirect and direct effects; and they include both short-term and long-term impacts.

Directions, decisions, and actions that have influenced management on the Glade come from various levels of influence. Local sentiment, culture and demand have and continue to influence management on the Glade. National direction and demand as provided through the US Forest Reserves and later the US Forest Service have also influenced management across the Glade. What prevails as the “best science” at the time was/is used in managing the Glade. Since “best science” changes over time, so have management methods and objectives. Although influential factors may have begun outside of the project area, the cumulative effects analysis area is bound spatially to the Glade landscape project area except where effects may cross local property or geographic boundaries.

For an extensive description of the background for this cumulative effects analysis, please refer to Appendix H. The scope for this analysis is the Glade landscape and adjacent areas of

influence, which may vary among the different resources. Temporally, this analysis begins from the early days of livestock grazing on the Glade running two decades following this analysis.

Below is a list of past, present and foreseeable future actions for consideration in completing the cumulative effects analysis.

Historic (Pre-USFS)	Past (Post-USFS)	Present	Future
Multiple-Use			
Individual **tree removal**, limited access and capabilities	Large timber logging camps and portable mills; CCC camps used to control insect outbreaks, improve roads, and watershed conditions	Continued logging to meet vegetation management objectives, use of better technology	Continued logging to meet vegetation and other ecological management objectives
Natural cycles of **forest pest** outbreaks	Large scale timber harvests with objective to reduce risk from bark beetle infestations	Recent bark beetle infestation in ponderosa pine centered at Lake Canyon. Still managing against beetle outbreaks	Increased disturbance factors such as bark beetle, fire, mistletoe, invasive species
No railroad	Railroad construction to Calf Allotment area for timber harvest purposes	No railroad, truck removal of trees	No railroad, truck removal of trees
Historic **fires**, minimal or no suppression capabilities	Historic fires, fire suppression, use of prescribed fire	Recent fires such as the Narraguinnep and Bradfield fire; continuation of prescribed fire	Continuation of prescribed fire; longer fire season, increased risk of high severity fires
Few if any noxious or invasive species	Introduction of noxious weeds and invasive species such as smooth brome and cheatgrass	Noxious weed treatment; emphasis on natives for revegetation projects	Introduction of new noxious weed species and continuation of native plants use for revegetation; More program emphasis on general invasive species management
Individual **mining** operations	Minimal exploration and development – mostly oil	Increasing oil and gas development; increase in water use and roads systems to support development	Continuing mineral development; seismic operations/shale play
Abundant **beaver**	Beavers extirpated to increase downstream water for irrigation	Gradual return of beaver populations resulting in gradual improvement of riparian areas	Continued beaver population growth and riparian area improvement
Abundant habitat and population of sage and sharptail **grouse**	Range vegetation work (e.g. sagebrush control), hunting, and drought likely resulted in the extirpation of sage grouse and sharptail grouse	Gradual return of sagebrush cover and other habitat improvement in a few areas through management	Possible reintroduction/re-establishment of sage grouse and sharptail grouse should habitat return at large scale
Large **deer** populations	Summer use by deer and spring/fall use by **elk**	Increase in elk populations, continued use	More/longer winter use by elk due to reduced

Historic (Pre-USFS)	Past (Post-USFS)	Present	Future
		predominantly spring/fall	winter snow levels and improved livestock management
Subsistence **hunting**	Subsistence and recreation hunting	Recreation hunting	Recreation hunting
Unrestricted **hunting** by both Native Americans and early European settlers	Brunot Hunting Agreement developed with Native American Tribes to allow continued hunting on specific public lands	Recreation conflicts between hunters and grazing permittees (ie. disturbance of animals)	Recreation conflicts between hunters and grazing permittees (i.e. disturbance of animals)
No motorized travel	Generally unrestricted cross-country motorized travel	Implementation of travel management restrictions	More intensive travel management
No roads	Improved roads to meet needs of vehicles	Roads and trails designated to meet needs of expanding motor vehicle types and capabilities	Intensive travel management to meet needs of increasing public and expansion of motor vehicle capabilities
Individual **recreation** use	Recreating publics increase, use is periodic and seasonal	Recreation use consistent, particularly heavy during holidays, weekends, and hunting season; increased conflicts between recreation use and livestock management (i.e. pasture gates left open, shared use of ponds)	Recreation conflicts continue with increased use
Occasional recreation **campers** and prolonged summer camps by permittees	Long-term logging camp in Big Water Spring area, CCC camps by Glade G.S. and in Sagehen	CCC concept still used via the Southwest Youth Corps (SYC)	Assume some organization exists that resembles CCC and SYC
Pot hunting and indiscriminate **cultural** artifact collecting	Protection of cultural resources via federal legislation	Continued cultural resource protection	Continued cultural resource protection
Homesteading until establishment of Forest Reserves	No homesteading	No homesteading	No homesteading
No **lands** designated State or Federal	Land exchange State/USFS (1940's); most State-owned parcels were not managed for livestock; most grazing was year round – creating less productive land	Newly acquired State parcels actively managed; reduced productivity still evidenced today; gradual improvements noted via increasing ground cover	Gradual improvement via successful range management continues on previous State parcels; Continuing land exchanges/purchases to meet land use plan objectives
Livestock Industry and Range Management			
Unrestricted livestock **grazing**	Custodial livestock management; very high dependence of local operators on public lands	More intensive livestock management via adjustments in livestock grazing to shorter seasons and fewer numbers;	Livestock management objectives become more intensive and therefore more compatible with other recognizes uses

Historic (Pre-USFS)	Past (Post-USFS)	Present	Future
		implementation of allowable use and more intensive management practices	such as water quality, recreation, and wildlife
Historic livestock **trailing**	Historic livestock trailing and establishment of stock driveways	Continued livestock trailing and continued use of stock driveways	Continued livestock trailing and continued use of stock driveways
Mixed herds, indiscriminant **breeding**	Herds separated by fences; specialized breeds and genetics develop	Specialized breeding resulting in higher livestock weights	Continued improvements in livestock genetics – more emphasis on locally produced foodstuffs
"**Public Lands**" do not exist	High dependence on public land use; less stable markets and financial institutions	Socio-economic fluctuations on cattle prices, feed prices	Socio-economic fluctuations on cattle prices, feed prices
Riparian areas considered sacrifice areas for livestock watering	Importance of riparian areas recognized, management begins	Increased emphasis on water quality and riparian management for wildlife habitat; SW willow flycatcher listed; More riparian area improvement projects [i.e. rock streambank work, willow planting, and tire stabilization in riparian areas (east side Brumley)]	Continued emphasis on water quality and riparian area management, continued intensification of livestock management practices, climate change may intensify efforts
No livestock **fences**	Extensive construction of livestock fences	Maintenance of livestock fences	Replacement of livestock fences, focused development of new fences to resolve specific problems
Few water developments	Intensive construction of water developments – mostly spring developments	Maintenance of water developments; intensive stock pond construction; water rights acquisition becomes an issue	Replacement of water developments; increasing tension between State and Federal entities on water rights issues; emphasis on improving existing structures
Diversion of Glade Lake to pond to cultivate the Glade; **natural wetlands/ponds** developed for livestock use	Glade Lake, Ferris and Beef Trail ponds fenced to protect waters for waterfowl and other intrinsic values; conflicts with livestock operators over use of reservoirs	Other water developed to replace use of fenced reservoirs; water rights acquired that emphasizes non-consumptive uses	Continued non-consumptive uses for these areas
McPhee Reservoir does not exist	Construction of McPhee Reservoir and purchase of surrounding private land	Creation of archaeological district and wildlife mitigation lands surrounding McPhee Reservoir	Continued emphasis on cultural resource protection and wildlife management in the area
Periodic **grasshopper** and Mormon **cricket**	Periodic grasshopper and Mormon cricket outbreaks	Late 1980's early 1990's grasshopper population	Continued periodic grasshopper and Mormon

Historic (Pre-USFS)	Past (Post-USFS)	Present	Future
outbreaks		increases; 2002-2003 Mormon cricket outbreak	cricket outbreaks with possible increase given warmer, drier conditions
Little or no **vegetation treatments** except those resulting from wild and man-caused fire	Vegetation treatments to maintain/increase livestock stocking rates such as rollerchopping, seeding, and herbicide use in shrub types	Vegetation treatments continue including mastication, prescribed fire, post-wildfire seeding, expansion of cheatgrass	Continued vegetation manipulation to meet land use plan objectives
Climate Change			
Periodic **drought**	Periodic drought	Persistent drought	More persistent drought with changing climate; higher temperatures year-long
Few if any noxious or invasive species	Introduction of noxious weeds and invasive species such cheatgrass	Slow expansion of cheatgrass	Possible rapid expansion of cheatgrass

Cumulative effects described below are grouped into general categories due to the similar and inter-related effects to those resources.

3.11.1 Soils, Vegetation, Invasive and Listed Plants, Rangeland Resources

Past, current, and potential future activities in the project area that are currently affecting soil conditions include roads and road maintenance, travel management, timber harvest, seismic exploration, recreation, historic livestock grazing, and vegetation treatments. These activities have locally reduced ground cover, organic matter and nutrients, and increased erosion, compaction, and soil displacement. For the most part, these impacts are minor and/or localized. Many of these activities have had a direct impact on soils through ground disturbance and the removal of vegetation. Indirect impacts have occurred by changing vegetation found on the landscape; nonnative undesirable species that reduce nutrient cycling, lower water infiltration rates, and increase erosion.

Suppression of naturally occurring wildfire, intensive and improperly managed livestock grazing, introduction of invasive plant species, extensive vegetation treatments (aerially application of herbicide, chainings, seedings), significant fluctuations in big game wildlife species populations (elk and mule deer), along with timber harvest and silvicultural activities (fencing plantations, mastication) over the past 50-120 years have changed the pattern of certain vegetation communities and altered natural regimes. Communities most affected include sagebrush and grass parklands, pinyon-juniper woodlands, ponderosa pine/oak forests, mountain shrublands and low gradient wetlands or swales.

Ponderosa pine plantations of the 1970's were often fenced to reduce impacts from livestock and wildlife, and had been a popular reforestation method for several years on the Glade (Gary Apple, personal communication, 12/14). Some permittees, however, protested the resulting loss of forage capacity. In response, the Forest Service promoted vegetation manipulation projects such as chaining, rollerchopping, and seeding to increase forage production and to

offset forage losses. These treatments uprooted (chaining) or chopped (rollerchopping) pinyon pine and juniper trees. The result was a temporary forage production increase, loss of trees and the accumulation of large debris piles. In some areas, brush encroachment resulted and in others nonnative grass species were seeded. Since no active management to restore native ranges through seeding is proposed under any of the three alternatives in this analysis, these conditions are not expected to change. However, Alternatives A and C would promote the expansion of desirable native species where remnant populations currently exist.

Actions that have increased the risk of invasive species infestations generally fall into two categories: Activities that spread weed seed, and 2) Activities that disturb the ground making establishment of weeds easier. Today, invasive species are spread through a variety of vectors including recreation stock, motor vehicles, work equipment, livestock, and any other user of the National Forest. Preventative methods are in place to minimize the spread of noxious weeds such as mandating certified weed-free hay or washing construction equipment prior to entry onto the Forest. While this may slow the spread, there are enough weed sources on the Forest these days that new infestations can begin from within.

Activities that encourage weed establishment include wild and prescribed fire, over or improper grazing, vegetation treatments, timber treatments, and motorized travel. Any activity that disturbs the ground can play a role in the establishment of weed infestations.

While the path to America has been much the same for all invasive nonnative species, noxious weeds play a peculiar role in they were often not seeded on a large scale basis, although they have spread to a large-scale. Weeds have the potential to displace native plants, disrupt fire cycles and impact soil and range health. Musk and Canada thistle for example are so persistent that even though its seeds may lay in the ground for years without sprouting, once conditions are right with ample moisture and/or sufficient disturbance, it grows and spreads. While control efforts are continuous, total eradication is not likely.

Although no known populations of plant species of concern exist on the Glade, their presence cannot be dismissed without survey of all potential habitat. Activities on the Glade that can impact these plants include anything that disturbs soil or vegetation. These include seismic exploration, road construction and maintenance, the spread of noxious and invasive plant species, climate change and prolonged drought, dispersed camping, and off-road vehicle use.

Weather patterns can have profound effects on range condition including forage production, ground water re-charge, soil moisture, spring water flow, stock pond replenishment, plant species survival, and more. Increased temperatures combined with decreased precipitation can lead to lower plant productivity which in turn decreases vegetative ground cover and litter. Low ground cover exposes soil to wind and water erosion and expedites soil moisture loss through evaporation.

As an example, dry climates can affect hydrology so that aspen stands become too stressed to persist, transitioning into a shrub-dominated community of oak, serviceberry and/or snowberry. A loss of aspen on the landscape would result in a loss of forage for livestock and wildlife, as well as a significant habitat for numerous wildlife species, as this vegetation type is one of the most productive on the Glade yielding up to 2000 lbs. of forage per acre (as opposed to 600 lbs. per acre in mountain shrublands dominated by oak). Ponderosa pine and Gambel's

oak are deep rooted and well established species on the Glade. They are also drought-tolerant species and are likely to remain or expand on the landscape given prolonged dry conditions.

Coupled with poor forage conditions, there is often a general scarcity of water for cattle under drought conditions since ponds and reservoirs depend on surface water from winter snow and rainfall to fill. Ranchers with permits on the Glade rely on springs and reservoirs to help distribute and water livestock. A lack of adequate winter snowpack results in insufficient water in many reservoirs and low water flows at springs. Although monsoonal rains can help to replenish, it usually takes deeper ground water to support springs and many reservoirs. The lack of water in some pastures renders them unusable for cattle or requires the hauling of water by permittees. Cattle depending on small, shallow, muddy water holes often have reduced health and loss of condition and weight. As drought conditions persist, water conservation practices become crucial. Livestock pressure on water sources will increase as will the need to maintain properly functioning structures with protected water sources.

In the early history of livestock grazing on the project area, it is likely that utilization by livestock was significant and widespread enough that the ability of post grazing fine fuels to carry a fire was impacted. However, there were such large wild fires on the Glade in the late 1800's and early 1900's to indicate that this effect was probably not a significant factor overall in fire frequency or intensity. Over time, as livestock grazing impacts have been greatly reduced, removal of fine fuels by livestock has become essentially a non-factor in fire starts, spread, or intensity except perhaps in localized areas.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

The exclusion of livestock would result in benefits to soils where there are currently trailing or trampling impacts. These impacts are generally minor and localized. Uninhibited motorized travel on the Glade once impacted soils. Current efforts to manage travel have had a positive impact on soils by reducing the number of roads and road-stream crossings. This has increased ground cover, organic matter and nutrients; decreased erosion, compaction, and soil displacement; and reduced the amount of sediment directly deposited into streams.

The removal of livestock grazing would mostly affect those areas where moderate or heavy livestock grazing has occurred which include areas with flatter slopes, parklands and wetlands where grazing is easy and preferred species may exist, areas relatively close to water, primary entry and exit gates, and those areas grazed early in the season. Changes would include increased litter, plant density and biotic soil crusts. Over time, there would be an increase in species still present but suppressed from grazing such as native bunchgrasses, some forbs, as well as riparian species inhibited from trampling and soil disturbance. Over longer time frames, some grass plants may tend to stagnate in the absence of disturbance, unless wildlife populations, wildfire, or other natural disturbance factors are sufficient to maintain plant vigor.

Some invasive plant species can be suppressed in areas where livestock graze, especially if cattle are managed to graze on weeds early in their growth cycle. Properly managed livestock grazing that result in light to moderate use of herbaceous plants maintains or improves plant vigor and results in little or no increase in bare soil (potential areas of weed establishment). In this situation, removing livestock grazing as proposed in this alternative, can have a detrimental effect on managing the spread of invasive species. On the other hand, areas where cattle

concentrate or have concentrated in the past may have a higher occurrence of bare ground and contain well established weed infestations. These areas are usually near water, trails, and corrals. In this situation, the removal of livestock can have a beneficial effect on the risk of invasive species spreading.

Currently there are no known plant species of concern occurring on the Glade landscape. Therefore, the removal of livestock would likely have no effect on plants of interest. However, until complete surveys for species of concern occur in all potential habitat, we cannot dismiss the potential for impacts. Impacts could occur from anything that disturbs vegetation including livestock. This alternative would remove any risk of impacts from livestock on plant species of concern.

Livestock dependence on reliable water sources would not be an issue under this alternative. The need for range management facilities such as fences, troughs, and corrals would also not be an issue under this alternative.

While the build-up of fine fuels would occur under this alternative given the removal of livestock grazing, given past history of the Glade, little or no effect is expected regarding elevated risk and intensity of wild fires. However, if drought conditions persist and forest insect infestations continue or expand adding timber fuel loads, the added fine fuels of no livestock grazing could cumulatively result in larger, more intense and faster moving wild fires.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

Maintaining current management of permitted livestock would result in impacts to soil by continuing high levels of bare ground in certain vegetation types and in localized areas. Current efforts to manage travel have had a positive impact on soils by reducing the number of roads and road-stream crossings. While this would help to offset the impacts of livestock grazing, other disturbance factors would negatively add to impacts such as potential seismic exploration, increasing impacts from dispersed camping, and the probability for prolonged drought. These activities combined with current livestock management would likely continue to decrease ground cover, organic matter and nutrients; increase erosion, compaction, and displacement; and increase the amount of sediment directly deposited into streams.

Maintaining current livestock management would continue impacts to vegetation in those areas where improperly managed livestock grazing occurs, such as grassland parks and swales. Given the probability for prolonged drought compounded with current use levels and poor livestock distribution, trends in soil and vegetation health would likely continue with those areas improving continuing to improve or stalling out and those areas declining continuing to decline, possibly more rapidly. Areas that appear to be stable or fluctuating, would likely start showing steady declines. Litter, plant density and biotic soil crusts would remain below desired conditions where they are currently lacking and native bunchgrasses would remain suppressed, eventually dying out in some areas. The removal of this native seed source for desirable species would require more active management in the future for its return (i.e. drill seeding followed by livestock removal, etc.). Given dryer conditions, the return of native bunchgrasses may not be possible. While grass plants would not stagnate from lack of disturbance, undesirable nonnative species would continue to dominate. These species would continue to spread and suppress more desirable species. Parkland meadows would continue to dry given

the inability of nonnative species to hold soil and soil moisture. Wetland swales would continue to dry, with streambanks not able to heal. Water tables in once saturated meadows would likely drop or continue to drop.

Some invasive plant species can be suppressed in areas where livestock graze, especially if cattle are managed to graze on weeds early in their growth cycle. Properly managed livestock grazing that result in light to moderate use of herbaceous plants maintains or improves plant vigor and results in little or no increase in bare soil (areas of weed establishment). Areas where cattle concentrate may have a higher occurrence of bare ground and continue to promote weed infestations. Since several vegetation types already exhibit too much bare ground and this alternative continues current management without efforts to improve ground cover, the spread of noxious weeds is mostly likely under this scenario.

Currently there are no known plant species of concern occurring on the Glade landscape. However, until complete surveys for species of concern occur in all potential habitat, we cannot dismiss the potential for impacts. Impacts could occur from anything that disturbs vegetation including livestock. This alternative would continue current livestock management and therefore maintain the current risk of grazing and trampling on plant species of concern.

Livestock dependence on reliable water sources would continue to be an issue under this alternative. The need for range management facilities such as fences, troughs, and corrals would also continue given the maintenance of current grazing permits.

The build-up of fine fuels would not occur under this alternative given the continuation of livestock grazing at current levels. Given the past history of fire starts on the Glade, little or no effect is expected regarding reduced risk and intensity of wild fires. However, if drought conditions persist and forest insect infestations continue or expand adding timber fuel loads, the reduction of fine fuels from livestock grazing could reduce the intensity and speed of wild fires.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

Adjusting current livestock management to improve ground cover, minimize heavy grazing, and improve water developments would reduce impacts to soil by minimizing levels of bare ground in certain vegetation types and in localized areas. Current efforts to manage travel would add to positive effects on soils by reducing the number of roads and road-stream crossings. These improvements would help to offset impacts to soil from other disturbance factors such as potential seismic exploration, increasing recreation, and prolonged drought. Range health improvements would include increased ground cover, organic matter and nutrients; decreased erosion, compaction, and displacement; and decreased amounts of sediment directly deposited into streams. These improvements would occur more slowly under this alternative than in Alternative A.

Implementing adaptive management would eventually minimize impacts to vegetation in those areas where over grazing occurs such as grassland parks and swales. Given the probability for prolonged drought this alternative would help build ecosystem resiliency by improving livestock distribution and maintaining proper use levels. Trends in soil and vegetation health would likely improve slowly with those areas improving continuing to improve and those areas that have

stalled out showing improvement. Areas where soil and vegetation trends are declining should slowly turn their trajectory indicating improvement. Litter, plant density and biotic soil crusts would increase towards desired conditions and native bunchgrasses would become more prevalent, eventually dominating sites. Grass plants would not stagnate from a long-term lack of disturbance, maintaining vigor in herbaceous vegetation. Desirable plant species would begin to dominate, suppressing undesirable nonnative species. Parkland meadows would slowly accumulate litter, holding more soil moisture and promoting the return of wetland plant species. Wetland swales would slowly heal bare banks and become more resilient to high spring or monsoonal water flows. Eventually over a long period of time, the water table may return closer to ground surface and return some dry meadows to wet meadows.

Some invasive plant species can be suppressed in areas where livestock graze, especially if cattle are managed to graze on weeds early in their growth cycle. Properly managed livestock grazing as proposed in Alternative C, would result in light to moderate use of herbaceous plants maintaining or improving plant vigor and resulting in little or no increase in bare soil (areas of weed establishment). There would always be areas where cattle concentrate, having a higher occurrence of bare ground and potentially containing well established weed infestations. These areas should only occur in small localized areas usually near water, trails, and corrals. Other activities on the Glade, however, would cumulatively add to the spread of invasive species, therefore, little or no change in weed management would likely be realized as a result of this alternative.

Currently there are no known plant species of concern occurring on the Glade landscape. However, until complete surveys for species of concern occur in all potential habitat, we cannot dismiss the potential for impacts. Impacts could occur from anything that disturbs vegetation including livestock. This alternative would continue livestock management and therefore maintain the risk of grazing and trampling plant species of concern.

Livestock dependence on reliable water sources would continue to be an issue under this alternative. The need for range management facilities such as fences, troughs, and corrals would also continue however, their condition should slowly improve given specific direction in Alternative C.

The build-up of fine fuels would not occur on managed areas under this alternative given the continuation of livestock grazing at current levels. Given the past history of fire starts on the Glade, little or no effect is expected regarding reduced risk and intensity of wild fires. However, if drought conditions persist and forest insect infestations continue or expand adding timber fuel loads, the reduction of fine fuels from livestock grazing could reduce the intensity and speed of wild fires.

3.11.2 Watershed, Water Quality, Riparian Vegetation

Roads and road maintenance; high impact areas of timber harvest, seismic exploration, and recreation; historic livestock grazing; and vegetation treatments have all had negative impacts to upland watershed conditions to varying degrees. These treatments have increased runoff and erosion across the landscape which can negatively impact riparian-wetland area conditions.

Water quality impacts occur as a result of upland activities (how much runoff and erosion are occurring in the watershed as a result of an activity) and through direct inputs into the water bodies themselves. Past, current, and potential future activities in the project area that are currently affecting water quality include roads and road maintenance, travel management, timber harvest, seismic exploration, recreation, historic livestock grazing, and vegetation treatments. These activities have affected runoff and erosion occurring across the landscape. Historic livestock grazing has also changed the conditions of some streams (e.g., Ryman Creek) so that they are receiving larger amounts of sediment through channel adjustment. Past vegetation treatments have changed the species of vegetation found on the landscape to a type that results in reduced water infiltration rates and increased erosion.

Riparian-wetland area impacts can occur indirectly as a result of upland activities (the riparian-wetland area becomes out of balance with the water and sediment being supplied by the watershed) and through direct contact with the riparian-wetland area. Direct negative impacts include a variety of changes to the hydrologic, vegetative, and erosional/depositional features of the riparian-wetland area.

Past, current, and potential future activities in the project area that are currently affecting riparian-wetland areas include: roads and road maintenance, travel management, timber harvest, seismic exploration, recreation, historic livestock grazing, and vegetation treatments. In some riparian areas, alteration of stream channels occurred and small wetlands and springs were degraded; drying out soils and changing the vegetation from riparian dominated to a more upland mix, at least for the foreseeable future.

Travel management has had a positive impact on watershed, water quality and riparian-wetland areas by reducing the number of roads and road-stream crossings. This has decreased runoff and erosion in watersheds and reduced the amount of sediment directly deposited into streams.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

The No Livestock Grazing Alternative would result in improvement of desired vegetation and soil conditions, which in turn improves watershed condition and water quality. These improvements however would be slow. Changes to soil cover, especially in terms of litter on upland sites, would only take a few years and would occur before changes in vegetation composition. It is only when ground cover improves and soil moisture increases that slow improvements to vegetation would occur. Bare ground may first be covered by weedy plant species but over time the expansion of desirable native bunchgrasses would occur. These grasses hold soil moisture and prevent erosion with their robust dense root masses (Appendix E). This would reduce overland flow and erosion, improving watershed conditions and water quality.

The no grazing alternative would positively impact riparian-wetland areas. Riparian plant species would begin to recover in swales and along stream channels. The return of willows is often the first sign of recovery. These improvements would help to offset impacts from prolonged drought conditions. The No Livestock Grazing alternative would positively impact water quality and water recharge. When riparian-wetland plant species return they help to hold water in soils and closer to ground surface. Often times streams that were once perennial,

begin to pool and then eventually flow again. Benefits from removing livestock would further add to the positive effects of travel management and road closures. Negative impacts from roads and high impact areas associated with timber harvest, seismic exploration, and recreation would continue to impact watershed conditions and water quality.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

The current grazing alternative could continue to have positive impacts on some allotments while negatively impacting water quality and watershed conditions in others. Current management on some allotments has shown to improve conditions while on other allotments, it has been insufficient to offset impacts from drought thus resulting in a decline in soil and vegetation health. Therefore, given prolonged drought; past negative effects of historic livestock grazing and vegetation treatments, impacts from roads and high impact areas associated with timber harvest, seismic exploration, and recreation, this alternative would likely continue to contribute to the decline in watershed health on the Glade landscape.

The current grazing alternative would positively and negatively impact riparian-wetland areas. While current management may be moving some areas toward desired conditions (Glade Creek in Mair Allotment), it is insufficient to provide the desired improvements in other allotments (lack of willows on Glade Ccreek on the Glade Allotment). In these cases, continuing the current management strategy under Alternative B would likely result in no net benefit.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

The Proposed Action Alternative would result in watershed and water quality improvement as a result of increases in desired vegetation and improved soil conditions. The Proposed Action would build resiliency into the land through improved ground cover, species diversity, increases in native bunchgrasses and other benefits. Improvement would be slow, much slower than under Alternative A. Changes to soil cover, especially in terms of litter on upland sites, would occur before changes in vegetation composition. Adjustments in grazing would cause this to occur over a relatively long time period.

The Proposed Action Alternative would positively impact water quality and riparian-wetland condition. It would offset the past negative effects of historic livestock grazing (less so where stream conditions have changed) and to a lesser degree, vegetation treatments. It would further add to the positive effects of travel management. It would not offset the negative impacts of roads or the high impact areas associated with timber harvest, seismic exploration, and recreation. The net result however, would be a positive cumulative effect.

3.11.3 Wildlife and Fish

Habitat is perhaps the most important limiting and controlling factor for the above listed species populations, particularly loss of habitat components as it effects foraging, resting, breeding, and dispersal. Other limiting factors include habitat fragmentation and geographic isolation, prey availability, low population density, low reproductive potential, predation, weather, parasites and disease.

The loss of natural predators such as wolves and grizzly bears resulted in an increase in prey species like deer and elk. Humans now act as the primary predator for many species.

Elk are expected to continue as the primary ungulate across the Glade given the predominance of grasses. Their current use of the Glade is as spring and fall transition range. Elk move from BLM lands, private cultivated fields, and the Dolores Canyon where they winter, northeast to private and state lands between Lone Mesa and Groundhog for the summer. This minimizes competition with livestock on the Glade for forage during the summer months. Forage needs, however, cross over during spring and fall. The popularity of hunting on the Glade results in heavy use of roads and numerous camping locations. These factors results in the trampling and removal of vegetation, and can alter livestock movements by camping near water sources or leaving gates open.

The construction of McPhee Reservoir altered game migration patterns and removed forage availability. To compensate for this loss, lands adjacent to the reservoir (Sagehen Allotment) were designated as mitigation for wildlife.

McPhee Dam also altered stream flows below the dam. Cottonwood galleries that once dominated the river bottom were removed to make way for farmland. Now that most of those farms are gone, cottonwood trees are returning. Current management objectives include a mix of open large meadows, dense willows for southwest willow flycatcher habitat, and patches of cottonwood trees.

Livestock grazing in the ponderosa pine has affected the amount of forage available for the prey species of the goshawk. Past and current recreational use, timber harvesting, and utility corridors have had a minor effect on the quality and quantity of goshawk habitat. Past and current grazing methods have contributed to a loss of quality riparian habitat, particularly springs. Road building and timber harvesting have resulted in a loss of habitat for the Lewis's woodpecker.

Loss or degradation of breeding habitat can occur through changes in hydrology or water quality. Other factors include habitat fragmentation, predation, disease, sensitivity to UV radiation, and recruitment into the population.

Past timber harvest in the analysis area increased the available forage, which is a benefit to big game in this area. Mortality due to hunting and predators affect elk populations. Roads indirectly influence mortality by providing hunters access into otherwise remote and inaccessible country, increasing the likelihood of elk mortality during the hunting season. Livestock grazing does not cumulatively contribute to elk population numbers.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

Alternative A would add to positive cumulative effects for wildlife. The abundance of food and cover resulting from no grazing would help to offset conditions from drought, loss of habitat from roads, dispersed recreation, mining development, and the spread of noxious weeds.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

Alternative B would cumulatively contribute to past and ongoing livestock grazing effects. Under Alternative B, livestock grazing would contribute to impacts of the northern goshawk by reducing prey availability, since some prey species depend on healthy grassland habitats. Past and current grazing methods have contributed to a loss of quality riparian habitat, particularly springs. This in turn, could affect the NLF.

Alternative B cumulatively contributes to habitat effects to big game. Livestock grazing, if not managed for satisfactory range conditions, lessens the quality of big game habitat. Elk will change their movements and habitat use, based on livestock presence and the condition of grassland parks. . Alternative B would cumulatively contribute the most habitat degradation of all the alternatives.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

Under Alternative C, livestock grazing would contribute to impacts of the northern goshawk although not as much as Alternative B. Under Alternative B, livestock grazing would contribute to impacts of the northern goshawk by reducing prey availability, since some prey species depend grassland habitats. However, this alternative manages for the return of native grass species and manages for allowable utilization levels which would minimize impacts to prey species. Past and current grazing methods have contributed to a loss of quality riparian habitat, particularly springs. This has impacted NLFs. However, this alternative would have a positive cumulative effect on NLFs since it actively strives to improve springs, seeps and wetlands within defined timeframes. Through monitoring and adaptive management and adherence to the design criteria, Alternative C would be an improvement over current conditions (Alternative B) for improving riparian-wetland health.

Livestock grazing, if not managed for satisfactory range conditions, lessens the quality of big game habitat. Elk will change their movements and habitat use, based on livestock presence and the condition of grassland parks. Alternative C improves big game habitat by restoring grassland parks and benefiting springs, seeps and wetlands. Elk and other wildlife species would likely continue to avoid certain areas where livestock are present.

3.11.4 Socio-Economics

Following the national trend, the dominant feature of the cattle industry in the area has been the steady decline in cattle production since the height of mid-1940s. Today, the agribusiness sector is a major economic driver in Dolores County, less so in Montezuma County, and cattle operations in these counties – about 470 of them according to the latest Agriculture Census – would likely continue to contribute to the regional economy given market conditions. Preliminary forecast shows per capita beef consumption in the U.S. to remain low (around 54.2 - 54.3 lbs. per capita), then decline through 2017 before rising moderately over the remainder of the projection period (through 2024).

The difficult nature of agribusiness and fluctuating market conditions are the norm and faced by permittees under any alternatives. However, under Alternatives A, it is possible that the reduction in available forage (through the elimination of grazing on the landscape) would increase private grazing fees in the surrounding area, due to increased demand from ranchers seeking to replace lost forage. If and when this occurs, this alternative creates additional and

lasting burden to the ranching community. It should also be noted that as with any other sectors, but especially in agribusiness, some operators will be profitable while many are not[7].

Although currently less than 3 percent of Dolores and Montezuma counties' land area is in the urban/built-up class, and that grazing is the largest class of private agricultural lands (and of relatively low value on a per acre basis); however, from the RPA land conversion study described previously, development pressure for ranch base properties exists. Private open space is generally abundant in Dolores and Montezuma counties. Should the land use of the permittee's base property change to either residential or commercial use, it will affect the immediate community; however, it would not materially affect local trends in open space.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

Based on the information presented above, implementation of any alternative analyzed in this DEIS would not result in significant cumulative impacts to economic conditions.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

Based on the information presented above, implementation of any alternative analyzed in this DEIS would not result in significant cumulative impacts to economic conditions.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

Based on the information presented above, implementation of any alternative analyzed in this DEIS would not result in significant cumulative impacts to economic conditions.

3.11.5 Heritage Resources

Under all the action alternatives, there is the potential that cultural resources could be impacted by the direct activity from livestock grazing over the landscape. Effects from the construction, modification, or removal of structures are not anticipated unless the structure was placed on or near a cultural site historically. In most instances, locations of structures can be adjusted to ensure proper management of the cultural resources. For this discussion we will assume minor effects from structural improvements.

Other projects on the Glade landscape include forest road and trail management, timber projects, prescribed fire, oil or gas exploration activities and all of these projects require cultural resources evaluation prior to their implementation. Cultural sites have been successfully avoided in recent past projects and are anticipated to be avoided by future projects.

[7] In Colorado, there were 4,123 beef and cattle ranching and farming operations reported positive annual cash income in 2012, with an average net gain of $69,536; while a total of 6,405 operations reported negative annual cash income in 2012, with an average net loss of $24,488 (USDA-NASS 2014).

Effects to cultural resources from non-governmental projects located on private land may occur but would be localized to the sites that occur only on those private lands and are not likely to affect cultural resource sites on FS lands.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

Because of cultural resources protection measures applied to all Forest Service projects including livestock management, the combined effects of livestock grazing and other project activities is not anticipated to cause significant cumulative effects.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

Because of cultural resources protection measures applied to all Forest Service projects including livestock management, the combined effects of livestock grazing and other project activities is not anticipated to cause significant cumulative effects.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

Because of cultural resources protection measures applied to all Forest Service projects including livestock management, the combined effects of livestock grazing and other project activities is not anticipated to cause significant cumulative effects.

3.11.6 Recreation and Travel Management

Historically, the improved transportation system on the Glade meant that grazing permittees were less apt to live with their livestock but travelled back and forth from home instead. Daily herding and management of livestock was reduced. Livestock that are not frequently herded into wooded and brushy areas to obtain feed, spend an inordinate amount of time in parklands, wetlands and riparian areas where feed is easily accessible. These areas are the first to exceed allowable use criteria. To exasperate this issue, many stock ponds were constructed in grass parks where equipment could be transported easily for purposes of construction and maintenance. This of course attracted livestock to these areas not only for feed but for water as well. Parks, wetlands, and riparian areas show more damage from historic livestock grazing than any other vegetation types on the Glade.

Two allotments (Long Park and Brumley) on the Glade currently employ full time riders to maintain regular consistent herding of livestock. Cow camps are permitted to allow grazing permittees/riders to stay with their herds to provide better management. Improved roads also shifted livestock operations so that most livestock these days are trucked, not herded, on and off the Forest. The expanded road system also increases access for exotic species introductions. Seeds from invasive weed species such as knapweed and musk thistle often spread via motor vehicles.

The recent Boggy-Glade Travel Management decision reduced the total number of fence crossings on roads across the Glade landscape through road closures. Implementation of the Boggy-Glade Travel Management decision is underway with publication of a Motor Vehicle Use Map and road signs that show where public driving is allowed. The Glade OHV trail was approved but has not yet been implemented. As described in the design features for the

Boggy-Glade decision, trail cattleguards will be placed at fence crossings for this trail. The total number of fence/road crossings is not expected to change in the near future.

The ongoing Lake Canyon Forest Health project displaces some dispersed campers and hunters when cutting or hyrdro-mowing or prescribed fire activities are underway. Project area boundaries are marked on the ground alerting recreationists to the presence of heavy equipment or smoke. While this may combine with livestock to displace campers, there are ample alternate sites for recreationists to use in the surrounding areas.

Past timber, fire management and seismic study projects had short term affects to recreation and scenery when they occurred, however these effects have since ended. Once the projects ended heavy equipment and helicopters left the area and disturbed areas were re-vegetated. No other future plans are underway that would change recreation or hunting activities. No future projects are anticipated that would change the scenic quality or recreation settings on this landscape, except perhaps oil and gas development which remains speculative at this time.

Cumulative Effects of Alternative A- No Permitted Livestock Grazing

A slight loss in use of the road system would occur as a result of this alternative, although ranchers on neighboring private land would continue to truck and trail their livestock through the Forest. Alternative A would remove the need for fences and associated cattleguards on the interior of the Forest but these would remain in use along forest boundaries. Campers would not be displaced by livestock and the scenery would change given no cattle and more abundant vegetation.

Cumulative Effects of Alternative B- Current Permitted Grazing and Management

Continued use of the forest road system at current levels would result from this alternative. Alternative B would maintain the need for fences and the associated cattleguards. Campers would continue to be displaced by livestock and the scenery would remain the same with livestock present and forage removed.

Cumulative Effects of Alternative C- Proposed Action with Adaptive Management

No change would be expected in the continued use of the forest road system from this alternative. This alternative would maintain the need for fences and the associated cattleguards. Campers would continue to be displaced by livestock and the scenery would remain the same with livestock present and forage removal.

3.12 Comparison of Effects

Appendix C provides a list of Applicable laws, Regulations and Plans which this analysis ties to. It also provides conclusions on conformance with that guidance.

Table 3.18 Summary of primary effects of each alternative on each resource analyzed in this DEIS

Resource	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
Soils	Rapid recovery	Problem areas remain	Problem areas slowly recover
Watershed & Water Quality	Water quality standards met; unhealthy water sources recover more rapidly	Water quality standards met; unhealthy water sources may or may not recover	Water quality standards met; unhealthy water sources recover slowly
Vegetation	Rapid recovery of bare ground, slower recovery of plant species diversity and return of native bunchgrasses; Possible loss of plant vigor in long term	Some places would have slow recovery of bare ground and plant species diversity with return of native bunchgrasses; other areas would continue to decline.	Slow recovery of bare ground with slower recovery of plant species diversity and return of native bunchgrasses
Invasive Plants	The greatest amount of ground cover results in the slowest spread of weeds; continued weed treatment required	The least amount of ground cover results in the fastest spread of weeds; continued weed treatment required	Improved groundcover results in slower spread of weeds; continued weed treatment required
TES Plants	No impact from permitted livestock	Potential impacts from grazing and trampling	Potential impacts from grazing and trampling
Wildlife & Fish	Improved wildlife habitat in the short-term, with possible decadence given the lack of grazing over the long-term	Some wildlife habitat would continue to have slow recovery while other areas would continue to decline	Recovery of wildlife habitat would occur with some areas improving slowly and others more rapidly
Socio-Economics	Most economic impact to livestock permittees and local communities	Least economic impact to livestock permittees and local communities	Some impacts to a few permittees possible; level of impact depends on outside forces and permittee ability to adapt
Heritage	No impact to cultural resources	Continued impacts as historically occurred	Continued impacts as historically occurred
Range	0 AUMs permitted; no grazing season; removal of range facilities, consumptive use of 0 acre feet of water	Maximum 19,568 AUMs permitted; grazing season 5/26-10/31; continued maintenance of range facilities with minor new construction, consumptive use of 24.6 acre feet of water	Average AUMs permitted is 18,023 with a maximum potential of 21,628 AUMs; maximum range of grazing season 5/10-11/10; continued maintenance of range facilities with minor new construction, consumptive use of 22.6 acre feet of water

Resource	Alternative A- No Permitted Livestock Grazing	Alternative B- Current Permitted Grazing & Mgmt.	Alternative C- Proposed Action with Adaptive Mgmt.
Recreation & Transportation	No recreation/cattle encounters; No need for cattleguards, fences or gates; rapid improvement of water sources and associated wildlife viewing	Continued encounters between recreation/cattle; continued need for cattleguards, fences and gates; water sources remain degraded reducing wildlife viewing opportunities	Continued encounters between recreation/cattle; continued need for cattleguards, fences and gates; slow improvement of water sources and associated wildlife viewing

Chapter 4: List of Preparers

A variety of people have been involved in conducting this analysis and in the development of this document. The primary players were the following interdisciplinary team members:

Name	Expertise
Interdisciplinary Team	
Cara Gildar	Ecology
Shauna Jensen	Watershed, Water Quality, Soils, Riparian Vegetation, Climate
Ivan Messinger	Wildlife, Fish
Debbie Kill	National Environmental Protection Act (NEPA)
Erin Turner-Bird	NEPA Assistant, Note Taker
Heather Musclow	Vegetation, Invasive Species, TES Plants, Rangeland Resources /IDT Leader
Interdisciplinary Team Consultants	
Elaine Sherman	Heritage Resources
Tom Rice	Recreation, Travel Management
Tasha Lo Porto	Socio-Economics
Tom Kochanski	GIS
Mark Tucker	Range Background
Chuck Quimby	Adaptive Management

Chapter 5: Consultation and Coordination

5.1 Federal, State and Local Agencies

The Glade project was presented for discussion with the Colorado Parks and Wildlife on April 28, 2015. The Montezuma and Dolores county commissions were briefed regarding the Glade Range Analysis throughout 2014. A meeting with the Dolores County Commission went into more depth on June 15, 2015. A field trip was held with the Montezuma County Commission on July 16, 2015 in which 20 individuals including county commissioners, the county public lands liaison, grazing permittees both on and off the Glade, and USFS officials were in attendance.

5.2 Tribal Governments

Native American Tribes were initially notified of this project during the Annual Tribal Consultation Meeting in August 2014 held at the Anasazi Heritage Center, Dolores, CO. A copy of this DEIS will be sent to the various tribes for further consultation. Tribes consulted include:

Ute Mountain Tribe

Pueblo of Kewa

Pueblo of Isleta

Pueblo of Taos

Pueblo of Picuris

Pueblo of Sandia

Pueblo of Cochiti

Pueblo of Santa Ana

Pueblo of Tesque

Pueblo of Nambe

The Hopi Tribe

Pueblo of Zia

Pueblo of Jemez

Pueblo of San Felipe

Pueblo of Pojoaque

Jicarilla Apache Nation

Ute Tribe of the Uintah & Ouray Reservation

Beclabito Chapter

Nenahnezad Chapter

Teec Nos Pos Chapter

Mexican Springs Chapter

Huerfano Chapter

Upper Fruitland Chapter

Crownpoint Chapter/Tsin Ya Nai Kidi

Aneth Chapter

Nageezi Chapter

The Navajo Nation

Gad'iiahi/To'koi Chapter

Hopi Cultural Preservation

Tribal Historic Preservation

Tribal Historic Preservation

Historic Preservation Office

5.3 Individuals/Organizations

Although grazing permittees affected by this analysis were involved early, public scoping officially began on June 4, 2015 when the Notice of Intent (NOI) to publish an EIS was published in the Federal Register. During the scoping period, the following meetings were held with the grazing permittees holding Term Grazing Permits within the analysis area:

Grazing Permittee Met With	Date of Meeting(s)
David James/Joe Wheeling, Brumley Allotment	3/19/15, 4/10/2015
Vance and Maria Koppenhafer, Calf Allotment	3/23/2015, 6/11/2015
Clint Schurr, Shane Baughman, John and Charlotte Johnson, Glade Allotment	3/19/2015, 4/7/2015
Ricky and Kelly Oliver, Lone Mesa Allotment	3/20/2015
Gayle Alexander, Long Park Allotment	3/20/2015
Steve and Pam Suckla, Mair Allotment	3/16/2015
Koppenhafers and Wallaces, Sagehen Allotment	3/19/2015, 3/17/2015, 4/22/2015
Steve and Cinthia Wallace, Salter Allotment	3/17/2015, 4/22/2015

In addition to individual meetings with livestock grazing permittees holding Term Grazing Permits within the analysis area, a field trip was attended by many of the affected permittees and others outside the analysis area on July 16, 2015. The Glade project was presented and discussed through a conference call with John Ratner of Western Watersheds Alliance on July 21, 2015.

Acronyms

AMP – Allotment Management Plan
AOI – Annual Operating Instructions
AUM – Animal Unit Month
CDPHE - Colorado Department of Public Health and Environment
CF – Cover Frequency
CFR – Code of Federal Regulations
CO – Colorado
CODOLA - Colorado Department of Local Affairs
CPW – Colorado Parks and Wildlife
DAU – Data Analysis Unit
DC – Desired Condition
DEIS - Draft Environmental Impact Statement
EIS - Environmental Impact Statement
EO – Executive Order
EPA – Environmental Protection Agency
ERS – Economic Research Service
ESA – Endangered Species Act
FAR – Functioning At Risk
FR – Forest Road
FSH – Forest Service Handbook
FSM – Forest Service Manual
G - Guidelines
HM – Head Month
IDT – Interdisciplinary Team
LRMP – Land and Resources Management Plan
MCR – Montezuma County Road
M&E – Monitoring and Evaluation
MIS – Management Indicator Species
N/A – Not Applicable
NASS - National Agricultural Statistics Service
NEPA – National Environmental Policy Act
NF - Nonfuntional
NFMA – National Forest Management Act
NFS – National Forest System
NLF – Northern Leopard Frog
OHV – Off Highway Vehicle
PDSI – Palmer Drought Severity Index
PFA – Post Fledging-family Area
PFC – Properly Functioning Condition

PJ – Pinyon-Juniper
RAMTG – Rangeland Analysis and Management Training Guidelines
RNF – Rooted Nested Frequency
ROD – Record of Decision
S - Standard
SHPO – State Historic Preservation Office
SJNF – San Juan National Forest
SOPA – Schedule of Proposed Actions
TACCIMO – Template for Assessing Climate Change Impacts and Management Options
TEP – Threatened, Endangered, Proposed (wildlife)
TES – Threatened, Endangered, Sensitive (plants)
US – United States
USDA – United States Department of Agriculture
USFS – United States Forest Service
USFWS – United States Fish and Wildlife Service
WCP – watershed Conservation practices handbook
WQCD – Water Quality Control Division

Glossary

Adaptive Management - A type of natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves testing, monitoring, evaluating, and incorporating new knowledge into management approaches based on scientific findings and the needs of society. Results are used to modify management policy.

Adaptive Management (as defined in this DEIS) - Adaptive management is defined as a process where land managers implement management practices that are designed to meet LRMP standards and guidelines, and would likely achieve the desired conditions in a timely manner. If monitoring shows that desired conditions, as described by LRMP Direction, are not being met, then an alternate set of management actions, the effects of which are analyzed in this DEIS, would be implemented to achieve the desired results.

Allotment - A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System lands, including national grasslands.

Allotment Management Plan (AMP) - The document containing the action program needed to manage the range resource for livestock utilization, and possibly wildlife utilization, while considering the soil, watershed, wildlife, recreation, timber, and other resources in a range allotment.

Allowable Use – The degree of utilization considered desirable and attainable on various parts of a ranch or allotment considering the present nature and condition of the resource, management objectives, and levels of management. Allowable use and proper use are not necessarily the same – you can have objectives that require or allow proper use criteria to be changed. Proper use is what is needed over time for sustainability. Allowable use can be lower (ex for faster recovery) or even higher (ex for control of some specific plant species such as weeds).

Analysis Area - One or more capability areas combined for the purpose of analysis in formulating alternatives and establishing various impacts and effects.

Animal Unit Month (AUM) - An AUM is used in reference to the amount of forage consumed by one mature cow with a calf or the equivalent (26 pounds dry forage material per day) and is often used when discussing grazing capacity and or forage demand.

Animal-Unit - Considered to be a mature 1,000-pound cow or the equivalent, based on an average daily forage consumption of 26 pounds dry matter per day.

Base Property - Those lands in a ranching enterprise that are owned and required to hold a term grazing permit.

Best Management Practices (BMP): A combination of practices that are the most effective and practical means of achieving resource protection objectives (primarily water quality protection) during resource management activities.

Big Game - Certain wildlife that may be hunted for sport under state laws and regulations, including elk, pronghorn antelope, mule and white-tail deer, turkey, and bighorn sheep.

Browse - Twigs, leaves, and young shoots of trees and shrubs upon which animals feed: in particular, those shrubs that are utilized by some livestock and big game animals for food.

Capable Rangeland - The potential of an area of land to produce resources, supply goods and services and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices such as silviculture or protection from fire, insects, and disease.

Class of Animal - Description of age and/or sex-group for a particular kind of animal. Example: cow, calf, yearling, ewe, doe, fawn, etc.

Consultation – 1) An active, affirmative process that (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals and (b) considers their interests as a necessary and integral part of the BLM and Forest Service decision-making process. 2) The legal obligation requiring the federal government, through consultation, to consider the interests of American Indian tribes and account for those interests in the decision-making process. This legal obligation is based in laws and numerous Executive Orders and statutes. 3) A process that involves discussions between a federal agency and the U.S. Fish and Wildlife Service or the National Marine Fisheries Service under Section 7(a)(2) of the Endangered Species Act of 1973, as amended, regarding potential impacts on a species or critical habitat listed under Section 4 of the act.

Continuous Grazing - The grazing of a specific unit by livestock throughout a year or grazing season.

Cover Type - The vegetative species that dominates a site. Cover types are named for one plant species or non-vegetative condition presently (not potentially) dominant, using canopy or foliage cover as the measure of dominance. In several cases, sites with more than one dominant species have been lumped together into one cover type. Co-dominance is not necessarily implied.

Cumulative Impact - The impact on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of the source (federal or nonfederal agencies, individuals). Cumulative effects can result from individually minor but collectively significant actions taking place over time.

Data Analysis Unit (DAU) – an area designated by the State of Colorado in which big-game is managed.

Deferment - Delay of livestock grazing on an area for an adequate time to allow plant reproduction, establishment of new plants, or restoration of vigor of existing plants.

Deferred Rotation - To discontinue grazing on various parts of a range in succeeding years, allowing each part of the range to rest successively during the growing season to permit seed production, establishment of seedlings, or restoration of plant vigor. Each rested part of the

range is grazed during the year. At least two, but usually three or more, separate grazing units are required.

Design Feature – Stipulations or actions that are built into an alternative helping to define the limits of actions and effects of the alternative.

Desired Condition - A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved.

Direct Effects - Environmental effects caused by an action and that occur at the same time and place.

Drought – Any year or sequence of years when annual precipitation amounts are less than 75% below average.

Endangered Species - Any species of animal or plant in danger of extinction throughout all or a significant portion of its range and so designated by the Secretary of Interior in accordance with the 1973 Endangered Species Act.

Ephemeral Stream- A wetland, spring, stream, river, pond or lake that only exists for a short period following precipitation or snowmelt.

Forage - Vegetation used for food by wildlife and livestock, particularly ungulate wildlife and domestic livestock.

Forage Production - The weight of forage that is produced within a designated period of time on a given area. In this document the weight is expressed as air dry, or oven dry.

Forbs - Any herbaceous plant other than those in the grass, sedge, and rush families. For example, any nongrass-like plant that has little or no woody material.

Forest Plan (Forest Land and Resource Management Plan) - A document that guides natural resource management and establishes standards and guidelines for a national forest or national grassland. Required by the National Forest Management Act.

Grassland (or Grass Parklands)- An opening in forested or shrubby vegetation producing perennial herbaceous vegetation, usually grass or glasslike

Grazing Capacity - The maximum number of livestock numbers for a given season, under management, that a given range area is capable of supporting. The grazing capacity is determined after several years of monitoring the effects of actual on-the-ground grazing and implementation of necessary changes in numbers and season based on that monitoring.

Grazing Season –On public lands, an established period for which grazing permits are issued.

Grazing System - A specialization of grazing management that defines systematically recurring periods of grazing and deferment for two or more pastures or management units. Some examples are: deferred grazing, rotation grazing, deferred-rotation grazing, and short-duration grazing.

Ground Cover - The percentage of material, other than bare ground, covering the land surface. It may include live and standing dead vegetation, litter, cobble, gravel, stones, and bedrock. Ground cover plus bare ground would total 100 percent.

Growing Season - In temperate climates, that portion of the year when temperature and moisture permit plant growth.

Habitat – The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Head Month (HM) – A HM refers to one month's occupancy of range by one weaned or adult animal and does not reference forage demand. It is used strictly as a billing process.

Herding: A strategy for managing cattle that maintains the animals in a "herd" and moves them from area to area.

Indirect Effects - Environmental effects caused by an action but resulting later in time or farther away in place, yet which are still reasonably foreseeable.

Interdisciplinary Team (ID Team) - A group of people with different specialized training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view and a broader range of expertise to bear on the problem.

Intermittent Stream – 1) A stream that flows only 50 to 90 percent of the year when it receives water from some surface source, such as melting snow. 2) A stream that does not flow continuously, as when water losses from evaporation or seepage exceed the available stream flow.

Key Area – An area selected to represent the most critical manageable plant communities within each pasture. They are that limited portion of the range where allowable use is reached first. They are commonly found on flats, parks, along drainage bottoms and near water.

Key Issue: A subject, question, or conflict of interest regarding management of National Forest System lands that was used in developing alternatives in this analysis.

Listed Species - Any species of fish, wildlife, or plant officially designated as endangered or threatened by the Secretary of the Interior or Commerce.

Litter - A surface layer of loose organic debris consisting of freshly fallen or slightly decomposed organic materials.

Management Indicator Species – A plant or animal species selected because their status is believed to (1) be indicative of the status of a larger functional group of species, (2) be reflective of the status of a key habitat type, or (3) act as an early warning of an anticipated stressor to ecological integrity. The key characteristic of a MIS species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs.

Meadow – 1) An area of perennial herbaceous vegetation, usually grass or glasslike. 2) Openings in forests and grasslands of exceptional productivity in arid regions, usually resulting from high water content of the soil (streamside situations, areas having a perched water table).

Mitigation Measures: Actions that are taken to lessen the severity of effects of other actions. - Includes avoiding an impact by not taking certain actions; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources or environments.

Native - A plant or animal indigenous to a particular locality.

No Action Alternative - An alternative that maintains established trends or management direction.

Non Key Issue: A subject, question, or conflict of interest regarding management of National Forest System lands that was not used in developing alternatives in this analysis.

Noxious Weeds - Those plant species designated as weeds by federal or state laws. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host for serious insects or diseases, and generally non-native.

Overgrazing - Continued heavy grazing over a period of years that exceeds the recovery capacity of the community and creates a deteriorated range.

Palatable Species (Range Management) - Plant species that are readily eaten by an ungulate animal.

Pasture - A land area consisting of grass or other growing plants used as food by grazing animals. Also an area used for grazing, often enclosed and separated from other areas by fences, hedges, ditches, or walls.

Perennial (plant) - A plant that lives for two or more years.

Perennial Streams - Streams that flow continuously throughout most years.

Permitted Grazing - Use of a National Forest System range allotment under the terms of a grazing permit.

Permittee - One who holds a permit to graze livestock on state, federal, or certain privately owned lands.

Plant Communities - Assemblages of plant species living in an area. A plant community is an organized unit to the extent that it has characteristics in addition to the individuals and populations and functions as a unit.

Prescribed Fire - Controlled application of fire to wild land fuels in either their natural or modified state, under specified environmental conditions, that allows the fire to be confined to

a predetermined area and, at the same time, to produce the fire line intensity and rate of spread required to attain planned resource management objectives.

Proper Functioning Condition (PFC) - Riparian/wetland areas achieve proper functioning condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This reduces erosion; improves water quality; filters sediment; captures bed load; aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize stream banks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supports greater biodiversity. The functioning condition of riparian/wetland areas is a result of the interaction among geology, soil, water, and vegetation.

Proper Use – The degree of utilization considered desirable and attainable on various parts of a ranch or allotment considering the present nature and condition of the resource, management objectives, and levels of management. Allowable use and proper use are not necessarily the same – you can have objectives that require or allow proper use criteria to be changed. Proper use is what is needed over time for sustainability. Allowable use can be lower (ex for faster recovery) or even higher (ex for control of some specific plant species such as weeds).

Proposed Action - In terms of the National Environmental Policy Act, the project, activity, or action that a federal agency intends to implement or undertake and which is the subject of an environmental analysis.

Protected Activity Center (PAC): An area established around a Mexican spotted owl nest or roost site, for the purpose of protecting the area. Management of these areas is largely restricted to managing for forest health objectives.

Range - Any land supporting vegetation suitable for grazing including rangeland, graze-able woodland, and shrubland.

Range Analysis - Systematic acquisition and evaluation of rangeland resources data needed for allotment management planning and overall land management.

Range Condition – 1) A rangeland is considered to be in satisfactory condition when the desired condition is being met or short-term vegetative objectives are being achieved to move the rangeland toward the desired condition or trend. Unsatisfactory condition is when the desired condition is not being met and short-term vegetative objectives are not being achieved to move the rangeland toward the desired condition or trend.

Range Management - A distinct discipline founded on ecological principles and dealing with the use of rangelands and range resources for a variety of purposes. These purposes include grazing by livestock, use as watersheds, wildlife habitat, recreation, and aesthetics, as well as associated uses.

Range Trend – Range trend expresses the direction of change in range condition over time in response to livestock management and other environmental factors.

Rangeland - Lands on which the native vegetation is predominately grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing usage. Includes lands revegetated naturally or artificially to provide a forage cover that is managed like native vegetation.

Rangeland Health - The degree to which the integrity of the soil, the vegetation, the water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as: Maintenance of the structure and functional attributes characteristic of a particular locale, including normal variability.

Ranger District - Administrative subdivision of the national forest or national grassland supervised by a district ranger who reports to a forest supervisor.

Record of Decision: A decision document prepared for an environmental impact statement that explains the rationale for the decision.

Regeneration - The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop itself.

Responsible Official - The Forest Service employee who has the delegated authority to make a specific decision.

Rest - To leave an area of rangeland ungrazed by livestock or unharvested by mechanical methods for at least one year (12 consecutive months).

Resilience: The capacity of a system to absorb disturbance and reorganize itself without irreversibly losing its desired composition and function.

Rest Rotation (Livestock Grazing) - An intensive system of management where grazing is deferred on various parts of the range during succeeding years, allowing the deferred part complete rest for one year. At least two, but usually three or more, separate grazing units are required.

Revegetation - The reestablishment and development of plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through reforestation or reseeding.

Riparian - The bands and adjacent areas of water bodies, water courses, seeps, and springs whose waters provide soil moisture in excess of what is locally available. This results in a moister habitat than that found on the contiguous flood plains and uplands. Refers to land bordering a stream, lake, or tidewater, and generally implies a particular type of habitat physiognomy often characterized by an over story of trees or other large woody plants with a complex under story of other woody and/or herbaceous species.

Rotation Grazing - A grazing scheme where animals are moved from one grazing unit in the same group of grazing units to another without regard to specific graze/rest periods or levels or plant defoliation.

Season-long Grazing (Livestock Grazing) - Allowing livestock to graze a single pasture throughout one growing season.

Section 7 Consultation: A formal process for consultation on the potential effects on threatened, endangered, or proposed species that occurs between the agency proposing an action (U.S. Forest Service) and the regulating agency (U.S. Fish and Wildlife Service).

Sediment: Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice, and has come to rest on the earth's surface either above or below sea level.

Sensitive Species - Those plant and animal species identified by Regional Foresters for which population viability is a concern, as evidenced by the following:

Social Analysis - An analysis of the social (as distinct from the economic and environmental) effects of a given plan or proposal for action. Social analysis includes identification and evaluation of all pertinent desirable and undesirable consequences to all segments of society.

Soil Compaction - A physical change in soil properties that results in a decrease in porosity and an increase in soil bulk density and strength.

Soil Erosion - The detachment and movement of soil from the land surface by water or wind. Soil erosion and sediment are not the same.

Soil Productivity - The inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be expressed in terms of volume or weight/unit area/year, percent plant cover, or other measures of biomass accumulation.

Species - A group of potentially interbreeding populations that is reproductively isolated from other such groups.

Species Composition – The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

State Historic Preservation Officer (SHPO) - A person appointed by a state's governor to administer the State Historic Preservation Program.

Stock Tank: An earthen tank for providing water for cattle and wildlife.

Stocking Rate (Livestock Management) - The actual number of animals, expressed in either animal units or animal unit months, on a specific area for a specific time.

Stream Health - The condition of a stream, relative to robust health, for that stream type and landscape, considering indicators such as channel pattern, slope, particle size, pool frequency and depth, bank vegetation, and woody debris, which reflect the stability and habitat quality of the stream.

Structural Improvement (Range and Wildlife): Any type of range or wildlife improvement that is human-made such as fences, water developments, or corrals.

Suitable Rangeland - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental

consequences and the alternative uses forgone. A unit of land may be suitable for a variety of individual or combined management practices(36 CFR 219.3)

Thinning - The practice of removing some of the trees in a stand to meet desired conditions. Two types of thinning may be done:

Term Grazing Permit - Official, written permission to graze a specified number, kind, and class of livestock for a specific period on a defined range allotment.

Threatened Species - Any species likely to become endangered within the foreseeable future throughout all or a significant portion of its range and that has been designated in the Federal Register by the Secretary of Interior as such.

Trend: Expresses the direction of change (if any) in condition, in response to past and existing cattle management practices, or land use activities combined with other environmental factors.

Trend Study (Trend Transect) – a transect or transects designed to be measured over a long term in order to assess a change in range condition.

Understory (Vegetation) - The lowest layer of vegetation in a forest or shrub community composed of grass, forbs, shrubs and trees less than 10 feet tall. Vegetation growing under the tree canopy.

Undesirable Species - 1) Species that conflict with or do not contribute to the management objectives. 2) Species that are not readily eaten by animals.

Unsatisfactory Soil Condition: Indicators signify that degradation of soil quality has occurred. Impairment of vital soil functions results in inability of the soil to maintain resource values, sustain outputs and recover from impacts. Soils rated in the unsatisfactory category are candidates for improved management practices or restoration designed to recover soil functions.

Utilization Levels (Livestock Grazing) - The portion of the current year's forage production by weight consumed or trampled by livestock. Utilization levels are usually expressed as a percentage.

Vacant Allotment: An allotment that has value from a livestock grazing standpoint and remains open to potential grazing in the future.

Waterlot: A range improvement usually constructed of fencing materials that encloses a watering structure, either in whole or in part, to close water off to cattle for certain periods of time or in perpetuity.

Watershed - The area of land, bounded by a divide, that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel (Dunne and Leopold, 1978), or to a lake, reservoir, or other body of water. Also called drainage basin or catchment.

Weed - Any plant growing where unwanted and having a negative value.

Wet Meadow - A meadow where the surface remains wet or moist throughout the growing season, usually characterized by sedges and rushes.

Wetlands - Those areas that are inundated by surface water or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

Wild and Scenic Rivers (WSR): Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted (Wild and Scenic Rivers Act usage).

Wildfire - Any wildland fire (uncontrolled unplanned) that requires a suppression action. This includes all fires not meeting the requirements of a prescribed fire.

Woodland: Plant communities with a variety of stocking comprised of various species of pinyon pine and juniper, typically growing on drier sites.

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Appendices